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TECHNICAL REPORT 162/86

SORPTION ISOTHERMS
A Catalogue

Kurt Kielsgaard Hansen

THE TECHNICAL UNIVERSITY OF DENMARK
DEPARTMENT OF CIVIL ENGINEERING
BUILDING MATERIALS LABORATORY

TECHNICAL REPORT 162/86

SORPTION ISOTHERMS

A Catalogue

Kurt Kielsgaard Hansen

Building Materials Laboratory
The Technical University of Denmark

December 1986

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Key words

Sorption isotherms, data base,
curve fitting, moisture

Abstract

In the present catalogue sorption isotherms for more than 100 materials are plotted. A page of the catalogue shows both data values and a figure with data points and approximated curves. The data base has been built up using an IBM PC.

PREFACE

Moisture fixation and moisture transport in building materials are studied as part of a long-term research program at the Building Materials Laboratory. The present catalogue dealing with sorption isotherms forms a part of the base which the future moisture transport programs will use. The catalogue is made by use of an IBM Personal Computer where the information about individual materials composes a data base. This data base can be exchanged with other institutions via a diskette, and the data base can be updated when new results are available.

The present work is part of the project "Moisture in Building Materials" which has been carried out at the Building Materials Laboratory during 1985 and 1986. The project has been supported by the Danish Technical Research Council (J.No. 16-3722.B-153).

Anders Nielsen
Project Leader

SUMMARY

The connection between the equilibrium moisture content in a building material and the relative humidity of ambient air at constant temperature is called a sorption isotherm. It is well known that most hygroscopic materials exhibit hysteresis in the adsorption and desorption isotherms.

In this catalogue sorption isotherms for more than 100 materials are plotted. Measured sorption values published in different literature sources are put into a data base, and for each set of values the best curve through desorption and adsorption measuring points, respectively, are fitted using the extended Posnow equation. A page of the catalogue shows both data values and a figure with data points and approximated curves.

An IBM PC has been used to build up the data base which is stored on a diskette marked SORPTION. The necessary data input and plotting programs for the data base as well as programs for curve fitting of data points are also stored on the diskette. The programs have been discussed in a separate report where the execution of the programs is described, too.

CONTENTS

1. WATER CONTENT PARAMETERS

The water content of a material can be described by e.g. the water to dry mass ratio, the water content per m^3, the capillary degree of saturation, and the vacuum degree of saturation /1/. In the present catalogue the water to dry mass ratio (moisture ratio, water content in weight percent) is used. The ratio (u) is determined by weighing a material sample (m_1 kg) and drying at 105° C until the mass is constant (m_2 kg). u can be calculated as

$$u = \frac{m_1 - m_2}{m_2} \qquad (1)$$

Using ρ for the dry density, the water content per m^3, w, is calculated by

$$w = \rho \cdot u \qquad (2)$$

The capillary degree of saturation in a material, S_{cap}, is the water content measured in proportion to the amount of water which the material can contain after spontaneous water suction.

The vacuum degree of saturation in a material, S_{vac}, is the water content measured in proportion to the amount of water which the material can contain after complete saturation by use of vacuum and overpressure.

S_{cap} and S_{vac} can be calculated by the equations given in /1/.

The relative humidity, ϕ_{pore}, in the pores of a porous material must also be regarded as a water content parameter. ϕ_{pore} expresses directly the activity of the water in the material, which is an important measure in durability judgments. Through ϕ_{pore} the water content in the material can be evaluated by means of the sorption isotherms as described below.

2. THE SORPTION ISOTHERM

2.1 Hygroscopic Moisture

In air with a certain relative humidity (RH or ϕ) and temperature (T) a porous building material after a while will reach a state of equilibrium with the

environment, i.e. the partial vapor pressure and the temperature of the water vapor in the pores of the material will be quite the same as in ambient air. The porous material will exchange water with the ambient air until the point of equilibrium is reached.

The maximum hygroscopic moisture content of any porous material is significantly less than the maximum moisture content which the body can acquire in suction, cf. Figure 2. For example, the maximum hygroscopic moisture content, u_h, in red brick is about 1 weight percent, but the maximum water content, u_{max}, is of the order of 20-30 weight percent.

2.2 The Shape of the Sorption Isotherm

The connection between moisture content and relative humidity at equilibrium at a constant temperature is called the sorption isotherm or simply the isotherm. Through the years a lot of isotherms have been found for different vapors and gases which have been adsorbed in different materials. Brunauer, Emmet, and Teller /2/ have grouped the isotherms in five different classes as shown in Figure 1.

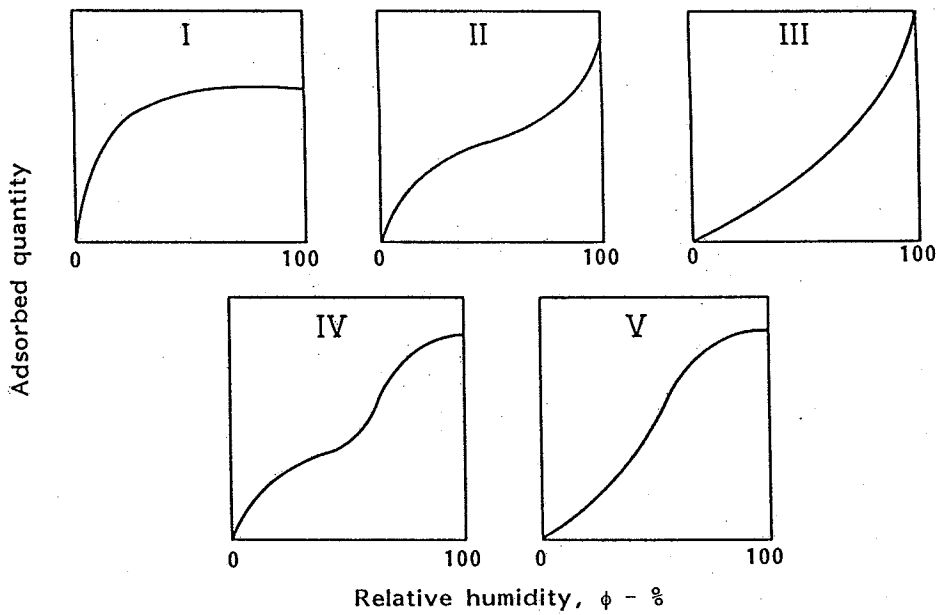

Figure 1. Different types of isotherms according to Brunauer, Emmet, and Teller /2/.

The isotherm Types I and II are the most common. Moisture fixation in porous building materials almost always gives S-shaped isotherms of Type II.

The shape of the equilibrium isotherm can be divided into three parts depending on the type of fixation, see Figure 2.

At low RH the water molecules are bound in one layer to the surface of the pores by hydrogen bond or van der Waal forces. When all surfaces of the pores are covered with one layer of molecules, the building of the next layer starts. The transition is marked by the fact that the curve is straight. The thickness of the adsorbed water layer increases to a third or possibly a fourth layer with an increasing pore humidity. Capillary condensation is the last mechanism that takes place. The saturation water vapor pressure above curved surfaces decreases depending on the curvature of the meniscus as expressed in the so-called Kelvin equation. This means that at a given RH all the pores with a certain radius will be filled with water.

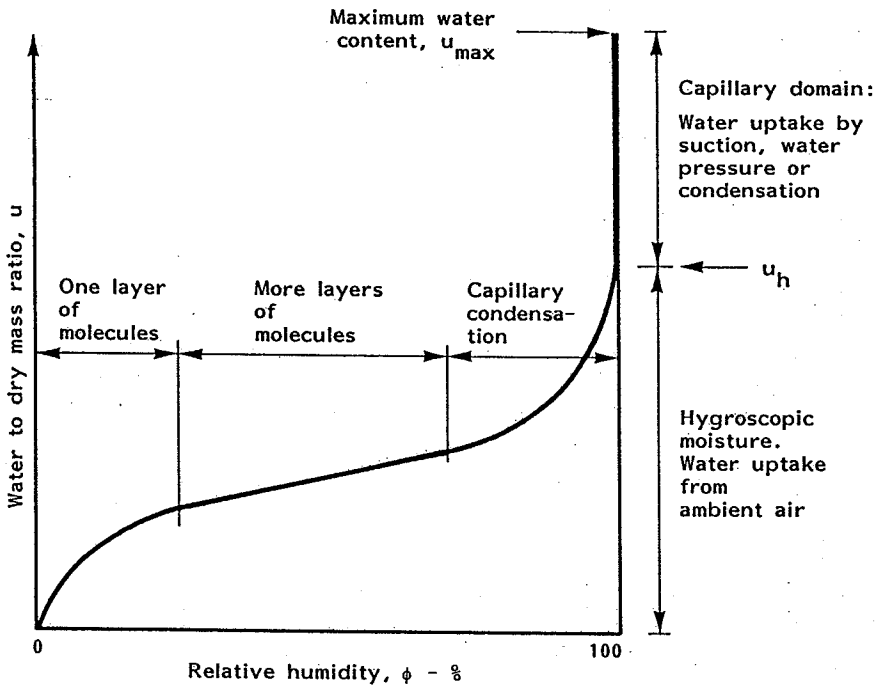

Figure 2. The typical course of an equilibrium moisture curve or sorption isotherm. The curve shows connected values of RH of the ambient air and water content of the material at equilibrium at a constant temperature.

At high relative humidities the course of the sorption curve becomes uncertain because of different hysteresis phenomena. Experimentally it is very difficult to maintain a constant RH above 98% which means an uncertainty in the different experiments reported in the literature. For these reasons the curve fitting in the present catalogue stops at 98% RH.

2.3 Adsorption and Desorption

Figure 3 shows a sketch of a sorption isotherm of a building material. Equilibrium established during drying gives a desorption isotherm, and equilibrium established during wetting gives an adsorption isotherm. Two boundary curves show a hysteresis loop. The desorption isotherm always lies above the adsorption isotherm at the same temperature. Different equilibrium conditions of the two curves can be reached either by breaking off the adsorption followed by desorption as ABC in Figure 4 or by breaking off desorption followed by adsorption as DEF. ABC and DEF are called scanning curves.

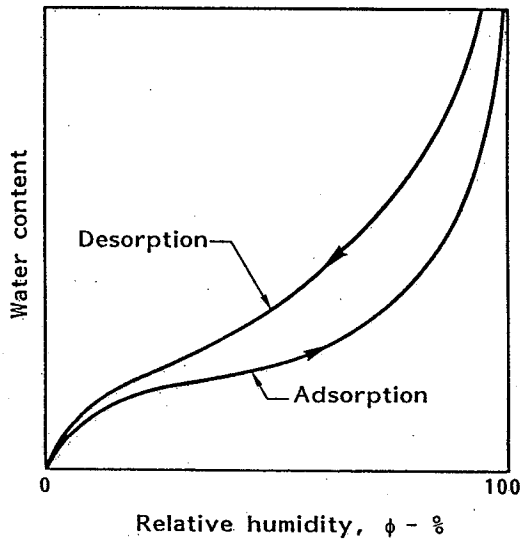

Figure 3. Typical adsorption and desorption isotherms showing hysteresis.

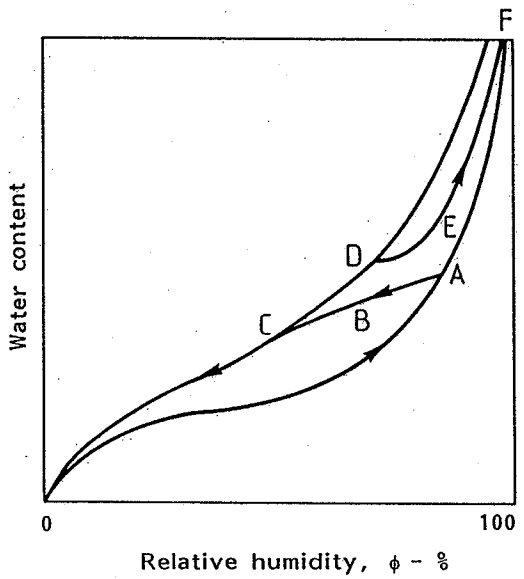

Figure 4. Example of scanning curves.

2.4 Temperature Influence

The equilibrium water content in the material is dependent not only on the relative humidity of the ambient air, but also on the temperature of the air. The position and the shape of the sorption isotherm are influenced by the temperature. At higher temperatures a correspondingly higher energy level causes an easier release of the water molecules. For this reason the "warm" isotherms lie under the "cold" ones. As an example sorption isotherms for wood at different temperatures are shown in the catalogue. The temperature influence of the isotherms will be taken up for discussion in a separate report.

3. USE OF SORPTION CURVES

The sorption isotherms are necessary in analyzing the moisture conditions of a structure such as drying or wetting calculations or judging the equilibrium state.

Example

Lime sandstone having a dry density of 1700 kg/m^3 is delivered with a production moisture content of 11% related to dry mass. The stones are used as an internal wall with a thickness of 110 mm. How much water must be dried from 1 m^2 before the wall is in equilibrium with 50% RH, 20^o C? On the desorption curve an equilibrium moisture content of 1.5 weight percent is found. The amount of water to be removed is Δu = 11% - 1.5%. Per m^2 is calculated

$$\Delta w = \text{volume} \cdot \text{dry density} \cdot \Delta u$$

$$= 1 \cdot 0.110 \cdot 1700 \cdot (0.11 - 0.015) = 17.8 \sim 18 \text{ kg water}$$

This result can be used in the design of the drying process.

4. MATHEMATICAL MODELS DESCRIBING THE SORPTION ISOTHERM

A lot of theories have been put forward concerning calculation of the adsorption of gases and vapors on solids. Among the most well-known theories are the Langmuir /3/ and the BET isotherms /2/, but also other models will be

mentioned here. The models are useful in curve fitting of experimental sorption data for use in computer calculations.

Langmuir assumes that the adsorption takes place in a single molecular layer (compare with Type I isotherms in Figure 1). The equation made by Langmuir looks like

$$u = \frac{a \cdot b \cdot \phi}{1+b \cdot \phi} \tag{3}$$

where a is moisture content absorbing a complete monolayer, and b is a coefficient proportional to the temperature.

The BET theory is built on the Langmuir theory, and it postulates that the polymolecular adsorption isotherm can be composed by a series of simultaneous Langmuir adsorption isotherms built up by single molecular layers. From the equilibrium condition for the sorption of 1st, 2nd, ..., n'th layer the following equation for the adsorption isotherm can be set up

$$u = \frac{a \cdot b \cdot \phi [1 - (n+1) \cdot \phi^{n} + n \cdot \phi^{n+1}]}{(1-\phi) \cdot [1 + (b-1) \cdot \phi - b \cdot \phi^{n+1}]} \tag{4}$$

For $n \to \infty$, the equation can be calculated to

$$u = \frac{a \cdot b \cdot \phi}{(1-\phi) \cdot [1 + (b-1) \cdot \phi]} \tag{5}$$

For n = 1, the Langmuir isotherm is found. The BET equation can be used to describe the lower part of the isotherm up to about 40% RH.

Lykow /4/ has given some empirical equations for calculation of isotherms. A second degree approximation has been suggested

$$u = a \cdot \phi^{0.5} \qquad \text{for } 0 < \phi < 35\% \text{ RF} \tag{6a}$$

$$u = A_o + B \cdot \phi^2 \qquad \text{for } 35\% < \phi < 94\% \text{ RF} \tag{6b}$$

A criticism against the shown set of equations says the dividing point of 35% RH will not hold for many materials. A variable dividing point in the range of 20-40% RH seems to be more useful.

Further, in the range of 10-90% RH, Lykow assumes the equilibrium moisture content can be calculated satisfactorily by use of the following empirical equation

$$u = \frac{G \cdot \phi}{H - \phi} \tag{7}$$

where G and H are material coefficients dependent on the temperature and the properties of the materials.

Lykow claims the Posnow equation gives the best approximation in the range 30-100% RH. The formula is derived from experiments with wood

$$\frac{1}{u} = \frac{1}{u_h} - B \cdot \ln\phi \tag{8}$$

where u_h is the maximum hygroscopic moisture content, and B is a temperature dependent factor. (Notice that an error may occur in Equation 8 as Lykow /4/ gives a "+" in front of the last term on the right side, but then we get a negative u for low ϕ.) Equation 8 can be rewritten

$$u = u_h \cdot (1 - \frac{\ln \phi}{d})^{-1} \tag{9}$$

where $d = 1/(u_h \cdot B)$. The constants for u_h and B given by Lykow (Table V in /4/) are by the present author used to calculate d for the following cases (given by Lykow), wood after previous drying, pine, and wood. Doing this calculation, d is found to be 0.30, 0.35, and 0.47, respectively. The d-values are used for comparison purposes in Section 4.1 below.

4.1 The Model Used in This Work

Freiesleben Hansen in /5/ gives an empirical equation for adsorption/desorption isotherms for hardening concrete

$$\phi = \exp(A \cdot (1 - (\frac{u}{u_h})^{-n})) \tag{10}$$

where

$A = (u_n/u_h)^n$
u_n = non-evaporable water content
u_h = maximum hygroscopically bound water by adsorption
n = empirically fixed exponent
ϕ = relative humidity
u = water to dry mass ratio

According to Freiesleben Hansen, A can be determined experimentally.

Using Equation 10 to curve fitting of measured sorption values, it can be appropriate to reorganize the equation to

$$u = u_h \cdot (1 - \frac{\ln \phi}{A})^{-1/n} \quad (11)$$

$$= u_h \cdot \exp((-\frac{1}{n}) \cdot \ln(1 - \frac{\ln \phi}{A})) \quad (12)$$

Equation 12 is applied in this catalogue. A is 0.34-0.38 for beech, birch, and a standard wood curve from the Technological Institute /13/ for n ~ 1. As mentioned above, d in Equation 9 can be calculated to 0.30-0.47 based on the values given by Lykow and consequently, when d = A, the two equations seem to be identical for n = 1. The introduction of n into Equation 11 makes it applicable to describe both the desorption and the adsorption values for most materials in the range 20-98% RH.

As mentioned earlier, the fixation of water in porous building materials gives S-shaped isotherms of Type II, see Figure 1. By use of the same equation describing all materials both in desorption and adsorption in the range 20-98% RH, the S-shape can be hidden in some cases. Firstly, the equation does not include the range 0-20% RH, secondly, the approximation can deviate from measured sorption values for higher relative humidities. For concrete, Ahlgren /6/ has measured desorption values which show a jump in the desorption curve, and this jump of course cannot be described by a common expression as Equation 11.

The adsorption isotherms of concrete are further discussed in /7/ where a curve fitting equation is given for relative humidities in the range 20-100% RH based on the composition of the concrete, i.e. cement content per m^3 (C), water to cement ratio (w/c), and degree of hydration (α). The calculation equation is also shown in /8/ where in addition the desorption isotherms of concrete are sketched dependent on w/c and α.

5. CATALOGUE SOURCES

Our main source for the present catalogue is the work of Ahlgren /6/. This thesis surveys the literature concerning determination of isotherms for different adsorbates and adsorbents. A result of the studies is that the desorption

isotherms very seldom are determined, especially isotherms of Type II which are interesting in connection with building materials. For adsorbates other than water vapor, especially adsorbates like gas, this absence of measurements depend mostly on difficulties in the experimental work. The conclusion of the problem may be filling the material with so much adsorbate that the absolutely highest lying desorption isotherms are determined. For building materials this filling with water vapor may not be a problem. Ahlgren's survey concludes that fully systematical determinations of both desorption and adsorption isotherms for the same material are missing. In most references only the adsorption isotherms are given, and in many cases it is not indicated if the curves refer to adsorption or to desorption.

To remedy the above mentioned findings, Ahlgren constructed an apparatus for precise determination of the equilibrium moisture content of materials for different relative humidities. The maximum error is calculated to 0.2% RH at high relative humidities. The experiments are started determining the desorption isotherm. To reach the highest boundary curve the material sample is filled with water before the start of the experiments. Afterwards the equilibrium moisture content is determined in the apparatus at relative humidities in the range 98-20% RH. Before determination of the adsorption isotherm the material sample is dried in an evacuated exsiccator with a drying material. The adsorption isotherms thereafter have been determined between the same limits for relative humidity as for desorption isotherms.

Ahlgren has determined a lot of sorption isotherms representing the most utilized porous building materials. Both desorption and adsorption isotherms are determined for the majority of the materials. The thorough experimental work and reporting made the measuring results of Ahlgren positively credible and most of the measuring results shown in /6/ are included in the present catalogue.

Tveit /9/ has determined isotherms at different temperatures. The equilibrium moisture content at high relative humidities is determined during adsorption while equilibrium moisture contents at low relative humidities are determined during desorption. These equilibrium moisture contents are bound together to an isotherm. As the hysteresis is smallest at low relative humidities, the curves correspond mostly to adsorption isotherms. In pursuance

of the above mentioned mix of desorption and adsorption measuring results in the same curve, the measuring results of Tveit are not comparable with other measuring results, and therefore they are not included in the catalogue.

Lück /10/ has given sorption values for a series of building materials in addition to paper, leather, textiles, tobacco, coke, and food. Sorption values for a series of these materials are included in the catalogue, but unfortunately the reference does not indicate whether these are desorption or adsorption values.

Also Krischer /11/ has given sorption values for a series of building materials in addition to paper, textiles, tobacco, potatoes, coke, and artificial materials. The temperature dependence for wood and potatoes in particular at temperatures between 20^{o} C and 80^{o} C has received special treatment. Sorption values for a series of these materials are included in the catalogue, among these the temperature dependence of the wood curves. Krischer mentions all the sorption isotherms shown to be desorption curves.

Included in the catalogue are measuring results for lacquer and paint, sand and gravel, soft rot decayed pine, brick with salt, and impregnated wood. The references are shown in connection with each curve.

The same material is illustrated by sorption values from various sources. This gives the possibility to evaluate the precision of the sorption isotherms.

6. REGISTRATION METHOD

The catalogue of sorption isotherms has been built up using an IBM PC. The data base can easily be distributed to other interested institutes by mailing a diskette.

The necessary programs for the data base, i.e. data input and plotting programs as well as programs for curve fitting of data points are also stored on the diskette which is marked SORPTION. The programs are described in /12/, which also explains in detail how to operate them. It has been attempted to write the programs as a dialogue. The program asks about input, and the

programmer types his answers, followed by a press on ⟵┘. The input form is simplified in this way, and at the same time all input of data appears in the correct order.

The data input program DATAIND is organized so that the input of data points can be made either by using the keyboard of the PC, or via digitizing using an HP plotter as a digitizer table. The sorption values for most of the materials in the data base are entered via digitizing*. Each material at each temperature level gets a material file in the data base.

The data input is carried out in the following way. Firstly, the title of the material, the density, and the temperature are read, in the next place sorption values (ϕ,u) for desorption and adsorption curves together with possible scanning curves, then possible additional material characteristics, and finally reference, date, and initials. If density and temperature are not known, a 0 (zero) must be written in both places. (No 0^{o} C sorption curves appear in the present edition of the catalogue.) The desorption values must be entered with decreasing ϕ, and the adsorption values must be entered with increasing ϕ, while the scanning curves must be supplied in the measured order. Using this concept for data input, the sorption values are written in the catalogue page in the measured order. If the reference does not indicate either desorption or adsorption values, the sorption values must be put in with increasing ϕ.

The curve fitting to create the best curve through desorption and adsorption measuring points, respectively, is performed by the programs DESORPF and SORPF using Equation 12. Using DESORPF, u_h, n, and A in Equation 12 are determined directly for desorption values, while SORPF is used for adsorption values and difficult desorption values. In SORPF, u_h is iterated, and n and A are determined directly. The use of Equation 12 till now has been found suitable to describe the desorption isotherms as well as the adsorption isotherms.

The iterated constants, u_h, n, and A, must be inserted manually in the material file, and after this operation the file can be used to plot a catalogue

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* If the literature reference has given more measurements of u for the same ϕ, the input of the u-values are done correctly, but a little displaced about the correct ϕ-value. This is done because in the beginning of the fitting work we tried with a polynomial representation which does not allow more u-values for the same ϕ. Unfortunately, the polynomial representation did not succeed and was left in favor of the above given exponential model, but the small displacements were not corrected as to be seen in the present catalogue. The small displacements will not have any practical significance.

page using the program UDTEGN. The catalogue page shows both sorption values and a figure with data points and curves. The scanning points are bound together with straight lines because DESORPF and SORPF are not created for curve fitting of these points.

7. SUMMARIZING REMARKS

A data base for sorption isotherms has been built up by use of an IBM PC with the appurtenant catalogue plotted as this report. The necessary data input and plotting programs in addition to programs for curve fitting of data points are given in a separate report /12/ also describing the execution of the programs. By putting the sorption catalogue on a PC one gets the advantage of updating and easy distribution to other interested institutes.

The curve fitting to create the best curve through desorption and adsorption measuring points, respectively, has been difficult because the literature has discussed the sorption isotherms only for selected materials. This report refers to some mathematical models describing the isotherms, and it shows that the model made by Freiesleben Hansen can be considered as a further development of the Posnow equation. The use of the above model has been found suitable to describe both the desorption and the adsorption isotherms. In some cases a few more sorption values would give a more precise curve fitting.

Different sources are used in the catalogue. As a principal rule the measured desorption and adsorption values and the scanning points given by the reference are put into the material file of the data base, and these data points are then used in the curve fitting. In older literature often only a sorption curve is given, but neither measuring results nor an indication about desorption or adsorption are stated. Nevertheless, such sorption curves are included in the catalogue primarily to present as many materials as possible, but also to show the link to the food science (Lück /10/ and Krischer /11/). Ahlgren /6/ has been the main source. His results include determination of the desorption isotherm, drying of the samples, and the determination of the adsorption isotherms. The thorough experimental work and reporting make the measuring results of Ahlgren positively credible, and most of the measuring results shown in /6/ are included in this catalogue.

8. LITERATURE

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9. CONTENTS OF THE CATALOGUE

MATERIALS	FILE NAME+	REMARKS
ASBESTOS AND ASBESTOS BOUND MATERIALS		
ASBESTOS	\A_B\ASBESTOK	
ASBESTOS-CELLULOSE CEMENT	\A_B\ASBCEC20.151	o
ASBESTOS CEMENT	\A_B\ASBCEM20.188	o
ASBESTOS CEMENT	\A_B\ASBCEM20.203	o
AERATED CONCRETE, see cellular concrete		
BRICK		
BRICK	\A_B\BRICK20.168	o
BRICK	\A_B\BRICK20.186	o
BRICK	\A_B\BRICK20.189	o
BRICK	\A_B\BRICK20.203	o
BRICK	\A_B\BRICK	
BRICK with salt	\A_B\BRICKSA	
CELLULAR CONCRETE		
CELLULAR CONCRETE	\C\CELCON20.230	o
CELLULAR CONCRETE	\C\CELCON20.475	o
CELLULAR CONCRETE	\C\CELCON20.500	o
CELLULAR CONCRETE	\C\CELCON20.501	o
CELLULAR CONCRETE	\C\CELCON20.510	o
CEMENT MORTAR		
CEMENT MORTAR w/c = 0.70	\C\CEMMOR20.070	*
CEMENT MORTAR w/c = 0.80	\C\CEMMOR20.080	*
CONCRETE		
CONCRETE w/c = 0.40	\C\CONCRE20.040	*
CONCRETE w/c = 0.44	\C\CONCRE20.044	*
CONCRETE w/c = 0.48	\C\CONCRE20.048	*
CONCRETE w/c = 0.52	\C\CONCRE20.052	*
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CONCRETE w/c = 0.61	\C\CONCRE20.061	*
CONCRETE w/c = 0.65	\C\CONCRE20.065	*
CONCRETE w/c = 0.66	\C\CONCRE20.066	*
CONCRETE w/c = 0.72	\C\CONCRE20.072	*
CORK		
CORK	\C\CORK	
CORK AND CORK MEAL	\C\CORK020.200	o

o Extension on file name relates to density.
* Extension on file name relates to w/c.
\+ File name refers to the diskette market SORPTION.

DRYING MATERIALS

MAGNESIUMPERCHLORATE	\M_U\MAGNESPE.800	o
SILICAGEL inorganic	\M_U\SILICAGE	

EXPANDED CLAY

EXPANDED CLAY	\D_K\EXPCLA20.910	o

EXPANDED POLYSTYREN AND FOAM MATERIALS

EXPANDED POLYSTYREN	\D_K\EXPPOL20.031	o
URETHANE FOAM	\M_U\UREFOA20.025	o

FOOD, CORN, AND TOBACCO

GELATINE	\D_K\GELATINE
POTATOES	\M_U\POTATOS
RUSK	\M_U\RUSK
RYE	\M_U\RYE20
STARCH	\M_U\STARCH
TOBACCO	\M_U\TOBACCO
WHEAT	\V_Z\WHEAT20

GRAVEL, SAND, SOIL, AND COKE

COKE	\C\COKE
DILUVIAL SAND fine	\D_K\DILUSAND
GRAVEL 0-8 mm Nymoelle	\D_K\GRAVEL
KAOLIN	\D_K\KAOLINK
KIESELGUHR	\D_K\KIESELGK
KIESELGUHR	\D_K\KIESELGU

GYPSUM

GYPSUM	\D_K\GYPSUM	
GYPSUM	\D_K\GYPSUMK.134	o
PLASTER OF PARIS	\M_U\PLASTE20.124	o

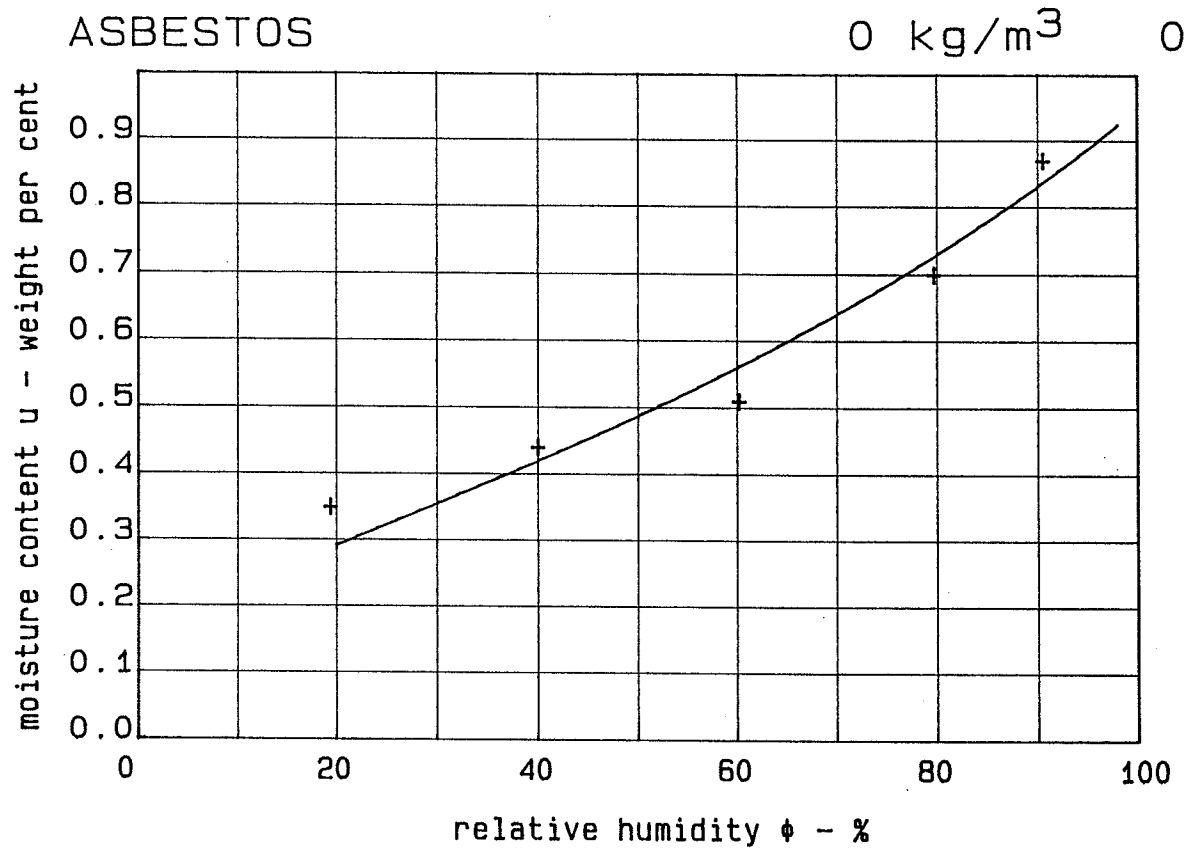
LACQUER AND PAINT

E.P. PAINT	\D_K\EPPAINT
LACQUER - 1	\L\LACQUE1
LACQUER - 1P	\L\LACQUE1P
LACQUER - 2	\L\LACQUE2
LACQUER - 2P	\L\LACQUE2P
LACQUER - 4	\L\LACQUE4
NC-LACQUER	\L\LACQUENC
NC-LACQUERP	\L\LACQUNCP
VINYL LACQUER	\L\LACQUEV

LEATHER		
LEATHER	\L\LEATHER	
LIGHT-WEIGHT CONCRETE		
LIGHT-WEIGHT CONCRETE	\L\LWCONC20	
LIGHT-WEIGHT CONCRETE	\L\LWCONC20.640	o
LIGHT-WEIGHT CONCRETE	\L\LWCONC20.670	o
LIGHT-WEIGHT CONCRETE	\L\LWCONC20.120	o
SIPOREX	\M_U\SIPOREXK.760	o
YTONG Siporex	\V_Z\YTONGKRI.520	o
LIME MORTAR AND LIME RENDERING		
LIME CEMENT MORTAR	\L\LICEMO20.550	o
LIME MORTAR	\L\LIMMORTK.180	o
LIME RENDERING	\L\LIMPLASK.160	o
LIMESTONE AND LIME-SANDSTONE		
LIME-SANDSTONE	\L\LIMSAN20.170	o
LIME-SANDSTONE	\L\LIMSAN20.180	o
LIME-SANDSTONE	\L\LIMSAN20.183	o
LIMESTONE grey	\L\LIMEST20.270	o
LINOLEUM AND PLASTIC CARPET		
LINOLEUM CARPET 2 mm	\L\LINCAR20.120	o
PLASTIC CARPET (PVC) 3 mm	\M_U\PLACAR20.120	o
MINERAL WOOL		
GLASS WOOL	\D_K\GLWOOL20.018	o
GLASS WOOL	\D_K\GLASWOOL	
ROCK WOOL	\M_U\ROWOOL20.042	o
PAPER AND SODA CELLULOSE		
FILTER PAPER	\D_K\FILTPAPE	
NEWSPRINT	\M_U\NEWSPRIN	
SODA CELLULOSE	\M_U\SODACELL	
PAINT see lacquer		
RUBBER		
RUBBER	\M_U\RUBBER	

SANDSTONE		
SANDSTONE red	\M_U\SANDST20.270	o
TEXTILE		
ACETATE	\A_B\ACETATE	
COTTON	\C\COTTON	
JUTE	\D_K\JUTE	
JUTE WEB	\D_K\JUTWEB20.100	o
LINEN	\L\LINEN	
6-POLYAMID	\M_U\POLYAMID	
SILK	\M_U\SILK	
WOOL	\V_Z\WOOL	
WOOL	\V_Z\WOOLLYK	
WOOD AND DECAYED WOOD		
BEECH	\A_B\BEECH020.750	o
BIRCH	\A_B\BIRCH020.600	o
OAK	\M_U\OAK00020.780	o
OREGON PINE	\M_U\OREPIN20.560	o
PINE	\M_U\PINE20.510	o
PINE Sapwood	\M_U\PINE10	
SPRUCE	\M_U\SPRUCE20.420	o
SOFT ROT DECAYED PINE	\M_U\SOFTROTW	
WOOD	\V_Z\WOOD20	
WOOD 20C	\V_Z\WOODSA20	
WOOD 40C	\V_Z\WOODSA40	
WOOD 60C	\V_Z\WOODSA60	
WOOD 80C	\V_Z\WOODSA80	
WOOD measured by 60C	\V_Z\WOODme60	
WOOD measured by 80C	\V_Z\WOODme80	
WOOD BASED MATERIALS		
BOARD hard	\A_B\BOARDH20.100	o
BOARD oil-hardened	\A_B\BOARDO20.105	o
BOARD porous	\A_B\BOARDP20.300	o
BOARD semi-hard	\A_B\BOARDS20.780	o
PLYWOOD	\M_U\PLYWOO20.600	o
WOOD-PARTICLE BOARD	\V_Z\WOODPB20.610	o
WOOD PULP	\V_Z\WOODPULP	
WOOD, IMPREGNATED		
PINE IMPR. W. B.F.P.	\A_B\BOLFPROF	
PINE IMPR. W. BOLIDEN K33	\A_B\BOLIDK33	
PINE IMPR. W. C.F.	\C\CELCUREF	
PINE IMPR. W. K33+M	\D_K\K33MINAL	
PINE IMPR. W. MINALITH	\M_U\MINALITH.510	o

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	90.5	79.7	60.2	39.9	19.4	0.0
u	0.87	0.70	0.51	0.44	0.35	0.00

Approximation:

u= 9.49E-01*exp((-1/0.92)*ln(1-ln(ϕ)/ 8.22E-01))

No scanning values

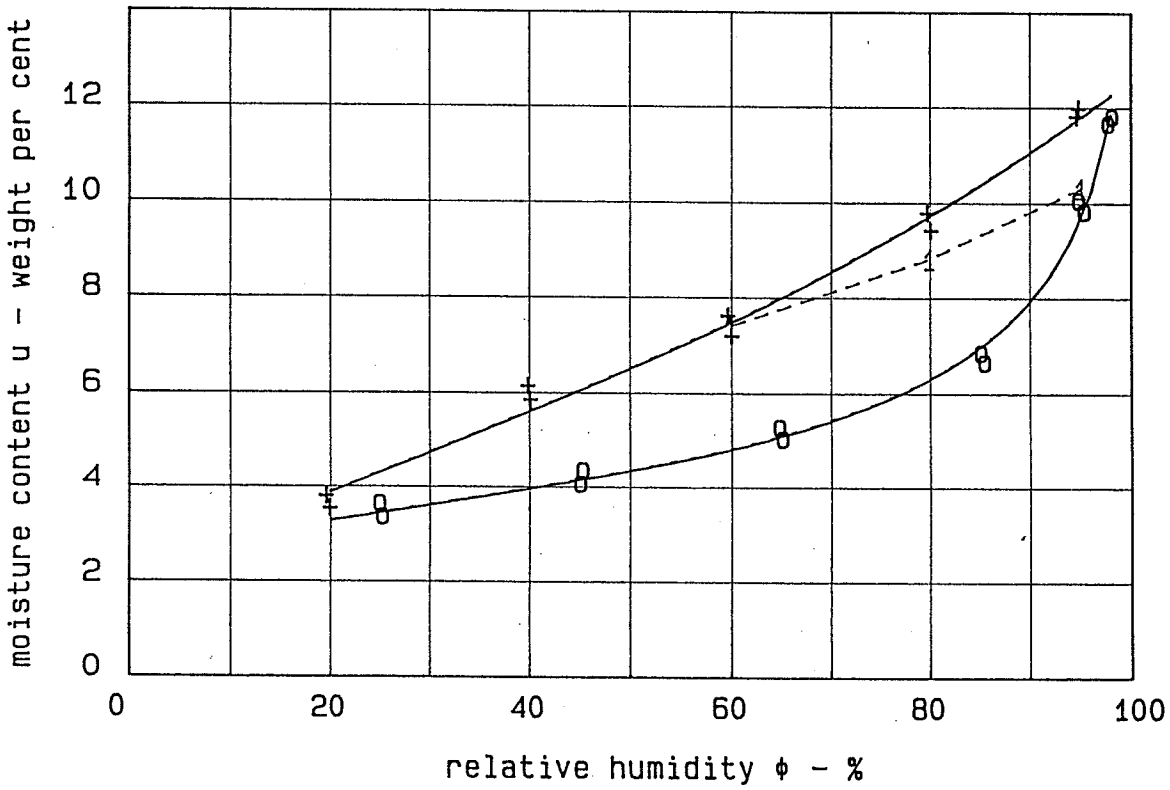
Notes: Density and temperature not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \A_B\ASBESTOK

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

ASBESTOS-CEL. CEMENT 1510 kg/m^3 20.0°C



\+ measured desorption values

ϕ	94.8	94.6	79.7	80.1	59.6	60.0	39.8	40.1	19.5	19.9
u	12.0	11.8	9.8	9.4	7.6	7.2	6.2	5.9	3.8	3.6

Approximation:
u= 1.26E+01*exp((-1/0.90)*ln(1-ln(ϕ)/ 8.60E-01))

o measured adsorption values

ϕ	25.2	24.9	45.0	45.3	65.1	64.8	85.5	85.1	95.4	94.8	97.7	98.1
u	3.4	3.7	4.1	4.4	5.0	5.3	6.7	6.9	9.8	10.1	11.7	11.8

Approximation:
u= 1.53E+01*exp((-1/2.92)*ln(1-ln(ϕ)/ 1.83E-02))

1 measured scanning values

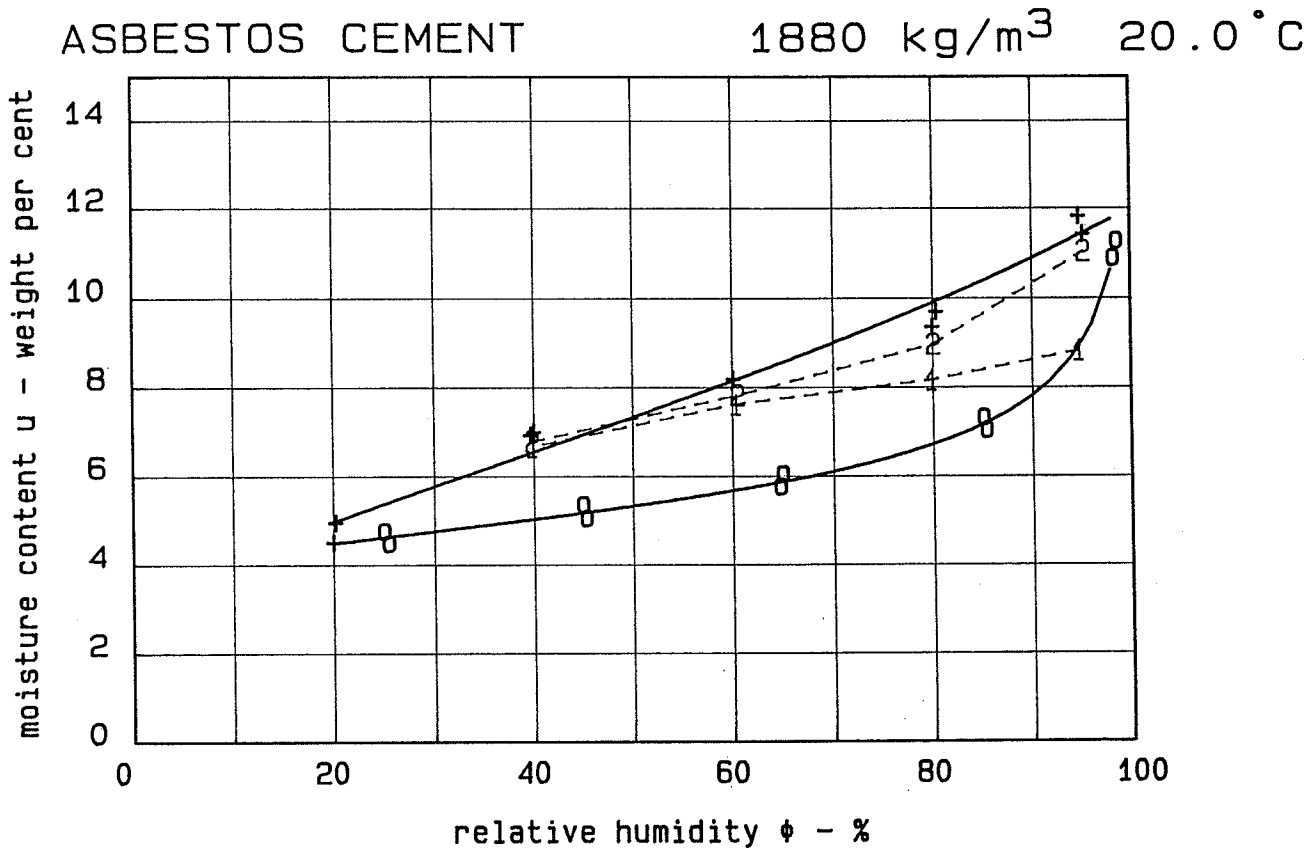
ϕ	95.0	79.9	59.9
u	10.3	8.8	7.4

Notes: Asbestos-cellulose cement. Open porosity=43%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: \A_B\ASBCEC20.151

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	94.8	95.2	80.3	79.9	60.1	40.0	39.6	20.2	20.0
u	11.8	11.4	9.7	9.4	8.2	7.0	6.9	5.0	4.5

Approximation:
u= 1.20E+01*exp((-1/1.17)*ln(1-ln(ϕ)/ 9.00E-01))

o measured adsorption values

ϕ	25.5	25.0	45.3	45.0	64.7	64.9	85.4	85.1	98.3	98.6
u	4.5	4.8	5.1	5.4	5.8	6.1	7.0	7.3	10.9	11.3

Approximation:
u= 1.51E+01*exp((-1/4.85)*ln(1-ln(ϕ)/ 4.56E-03))

1 measured scanning values

ϕ	94.7	79.8	60.3	39.8
u	8.8	8.1	7.6	6.7

2 measured scanning values

ϕ	39.8	60.5	80.0	95.2
u	6.8	7.8	9.0	11.0

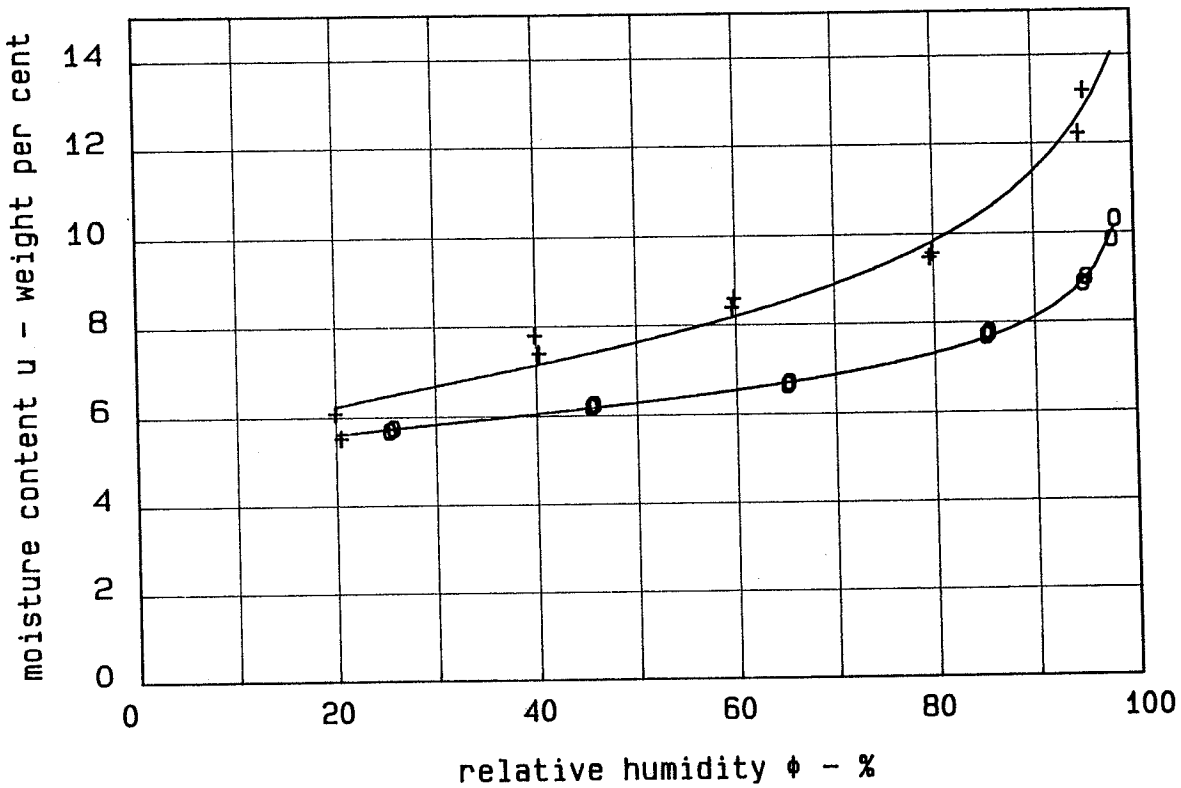
Notes: Asbestos cement, lightly pressed, 1800 kg/m3, open porosity=37%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 8-10-85 Initials: KKH File: A_B\ASBCEM20.188

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

ASBESTOS CEMENT 2030 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	95.1	94.6	79.9	79.6	59.9	59.6	39.9	40.3	19.9	20.5
u	13.2	12.2	9.6	9.5	8.6	8.4	7.8	7.4	6.1	5.5

Approximation:

u= 1.54E+01*exp((-1/3.99)*ln(1-ln(ϕ)/ 4.48E-02))

o measured adsorption values

ϕ	25.4	25.8	45.5	45.7	65.1	65.3	85.2	85.5	94.8	95.1	97.7	98.1
u	5.7	5.7	6.2	6.2	6.7	6.7	7.7	7.8	8.9	9.0	9.8	10.3

Approximation:

u= 1.65E+01*exp((-1/7.36)*ln(1-ln(ϕ)/ 5.80E-04))

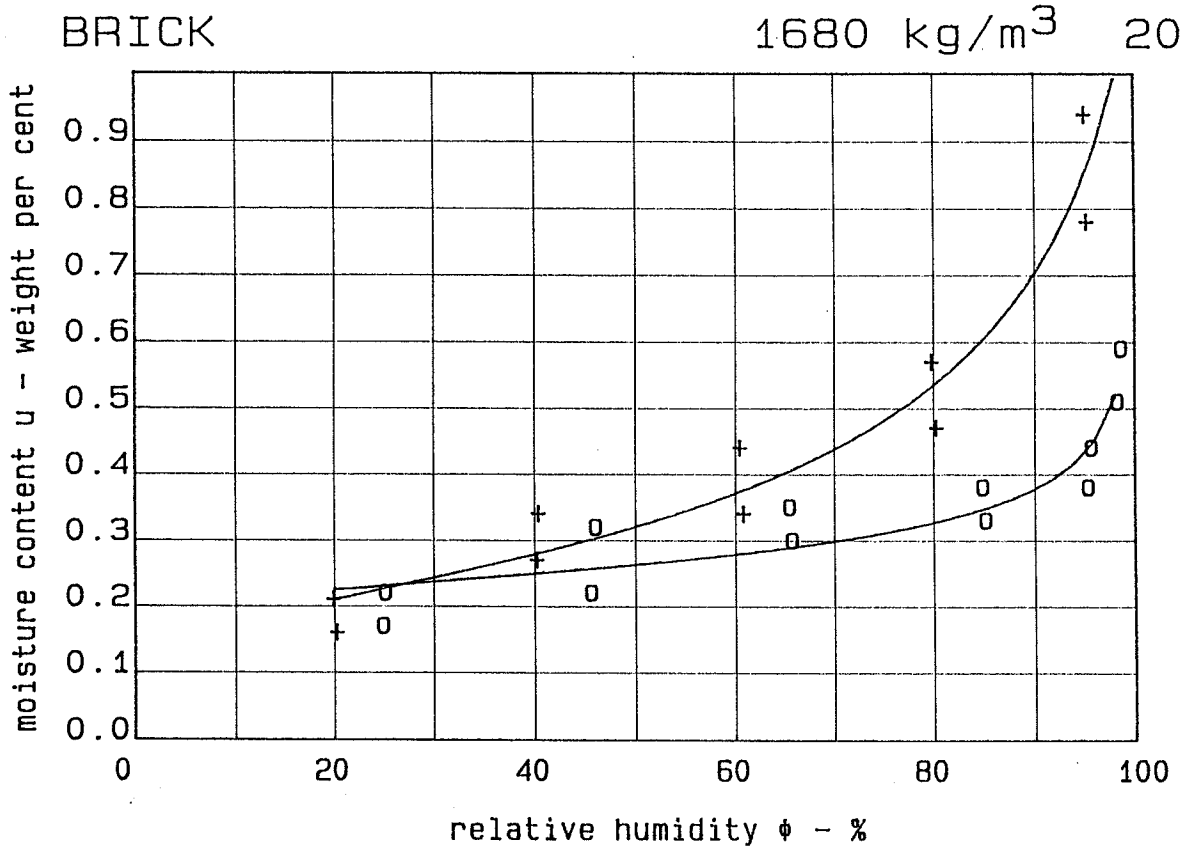
No scanning values

Notes: Asbestos cement, heavily pressed, 2030 kg/m3, open porosity=30%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 8-10-85 Initials: KKH File: A_B\ASBCEM20.203

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ 95.0 95.2 79.8 80.3 60.4 60.8 40.3 40.2 19.9 20.2
u 0.94 0.78 0.57 0.47 0.44 0.34 0.34 0.27 0.21 0.16
Approximation:
u= 1.13E+00*exp((-1/1.85)*ln(1-ln(ϕ)/ 7.48E-02))

o measured adsorption values

ϕ 24.9 25.1 45.6 46.1 65.7 65.5 85.2 84.9 95.3 95.6 98.2 98.6
u 0.17 0.22 0.22 0.32 0.30 0.35 0.33 0.38 0.38 0.44 0.51 0.59
Approximation:
u= 1.82E+00*exp((-1/5.24)*ln(1-ln(ϕ)/ 2.79E-05))

No scanning values

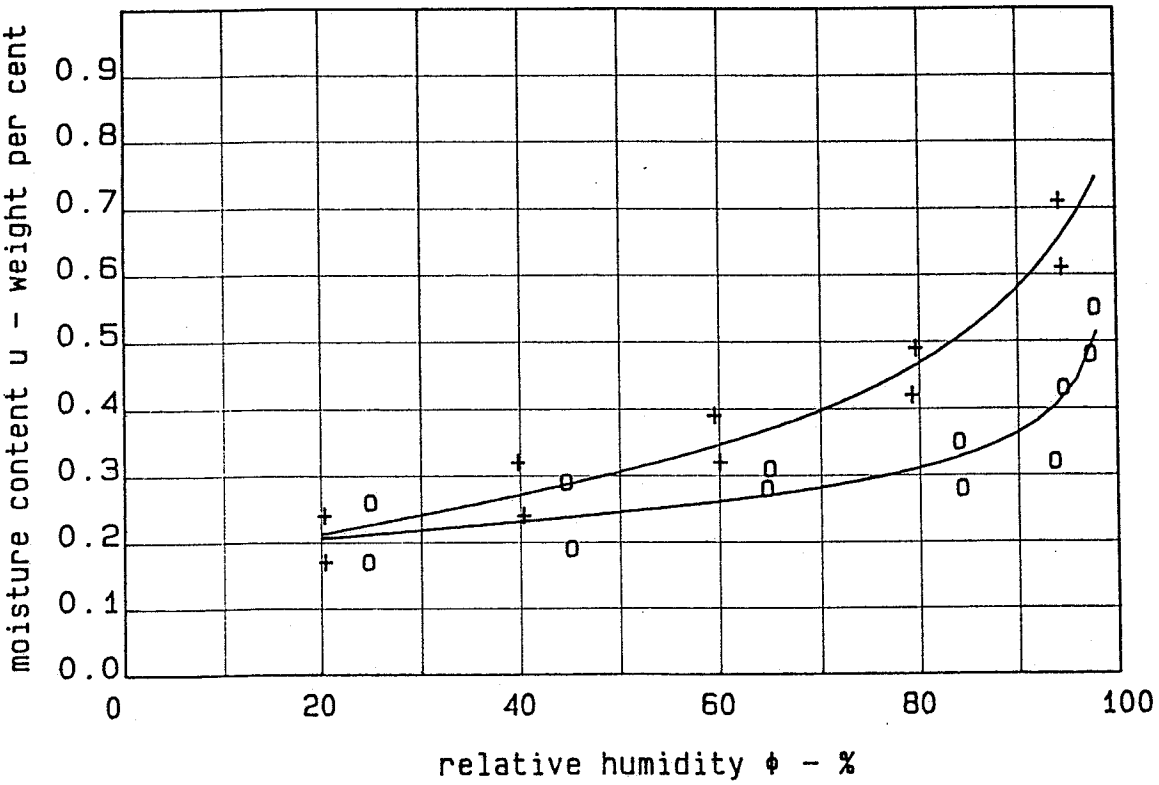
Notes: Open porosity=40%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: brick20.168

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

BRICK 1860 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 94.2 94.5 79.6 79.3 59.5 60.1 39.8 40.3 20.3 20.4
u 0.71 0.61 0.49 0.42 0.39 0.32 0.32 0.24 0.24 0.17
Approximation:
u= 8.11E-01*exp((-1/2.09)*ln(1-ln(ϕ)/ 1.04E-01))

o measured adsorption values

ϕ 24.7 25.0 45.1 44.6 64.7 65.0 84.3 84.0 93.7 94.6 97.4 97.8
u 0.17 0.26 0.19 0.29 0.28 0.31 0.28 0.35 0.32 0.43 0.48 0.55
Approximation:
u= 1.15E+00*exp((-1/4.76)*ln(1-ln(ϕ)/ 4.45E-04))

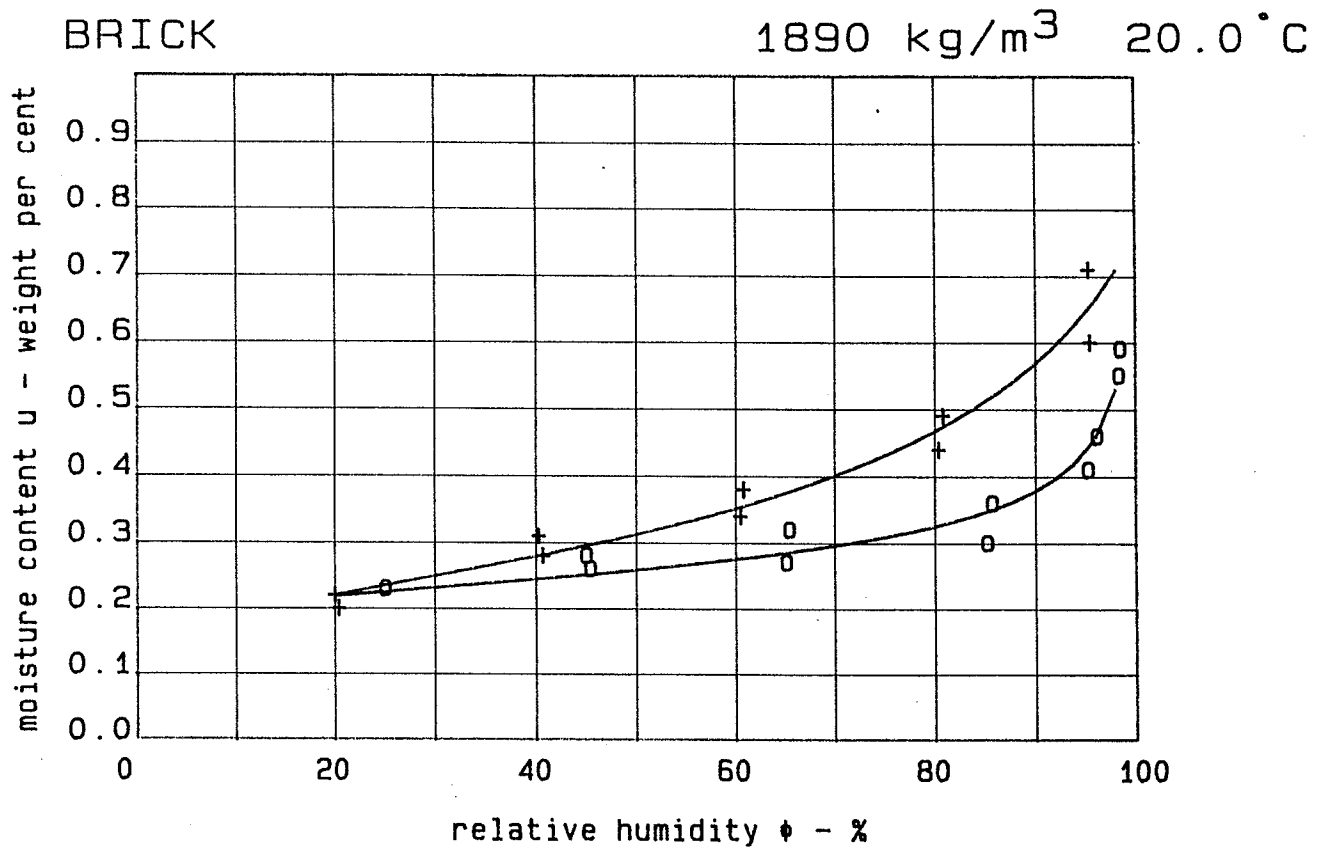
No scanning values

Notes: OPEN POROSITY 31%

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: \A_B\BRICK20.186

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	95.2	95.4	80.7	80.3	60.7	60.4	40.2	40.7	19.9	20.4
u	0.71	0.60	0.49	0.44	0.38	0.34	0.31	0.28	0.22	0.20

Approximation:
u= 0.76*exp((-1/2.14)*ln(1-ln(ϕ)/ 1.21E-01))

o measured adsorption values

ϕ	25.0	45.3	44.9	65.1	65.4	85.2	85.6	95.2	96.1	98.3	98.4
u	0.23	0.26	0.28	0.27	0.32	0.30	0.36	0.41	0.46	0.55	0.59

Approximation:
u= 1.63*exp((-1/4.93)*ln(1-ln(ϕ)/ 7.97E-05))

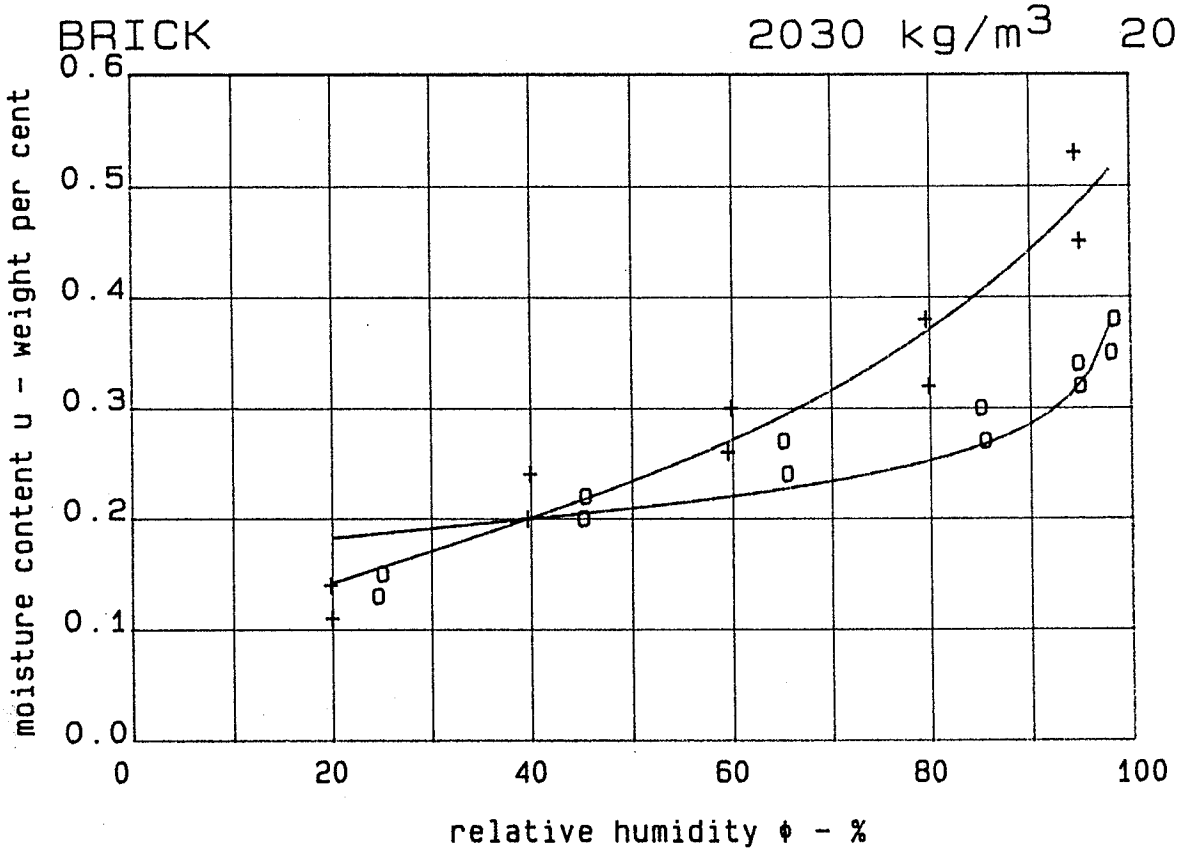
No scanning values

Notes: Open porosity 31%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: brick20.189

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	94.5	95.0	79.6	79.9	59.9	59.5	39.9	39.6	19.8	20.0
u	0.53	0.45	0.38	0.32	0.30	0.26	0.24	0.20	0.14	0.11

Approximation:
u= 5.36E-01*exp((-1/1.23)*ln(1-ln(ϕ)/ 3.91E-01))

o measured adsorption values

ϕ	24.6	25.0	45.2	45.4	65.5	65.1	85.5	85.1	95.0	94.8	98.1	98.4
u	0.13	0.15	0.20	0.22	0.24	0.27	0.27	0.30	0.32	0.34	0.35	0.38

Approximation:
u= 1.82E+00*exp((-1/6.08)*ln(1-ln(ϕ)/ 1.36E-06))

No scanning values

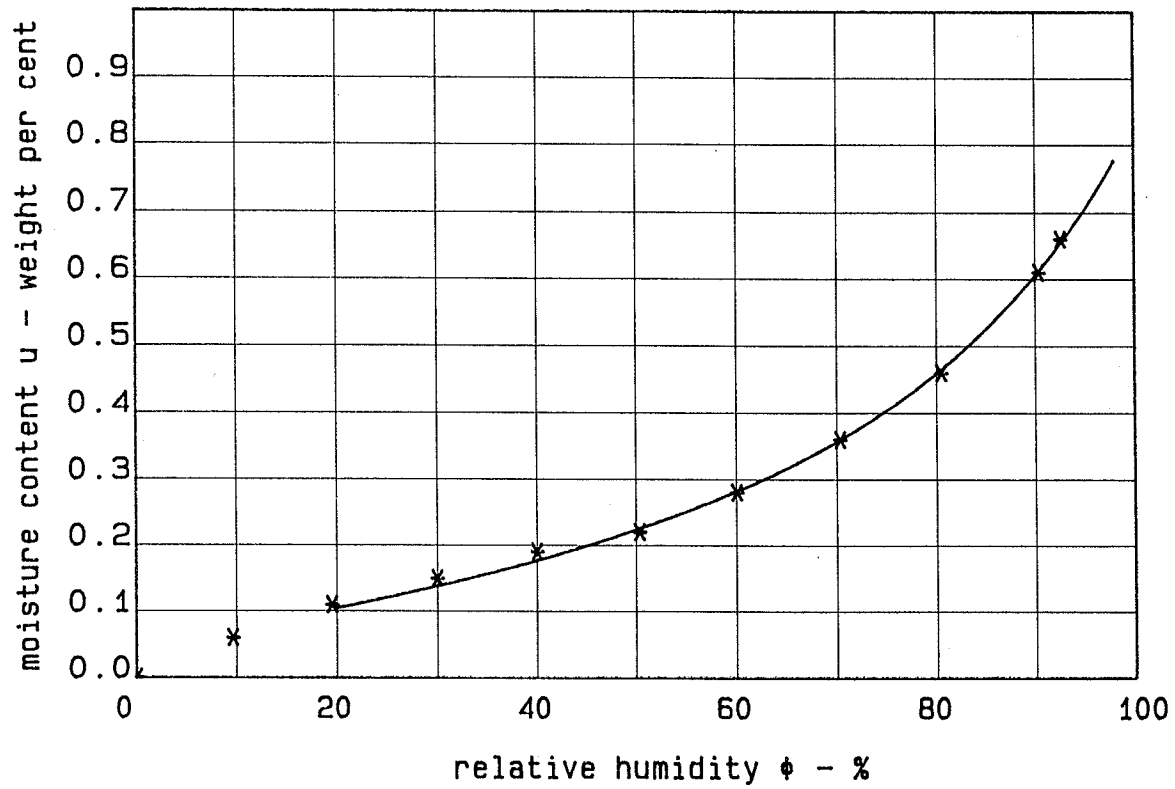
Notes: Open porosity 14%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: brick20.203

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

BRICK 0 kg/m^3 0.0°C



* measured sorption values

ϕ	0.1	9.7	19.5	30.0	40.0	50.4	60.1	70.4	80.5	90.4	92.6
u	0.00	0.06	0.11	0.15	0.19	0.22	0.28	0.36	0.46	0.61	0.66

Approximation:

u= 8.30E-01*exp((-1/0.83)*ln(1-ln(ϕ)/ 3.52E-01))

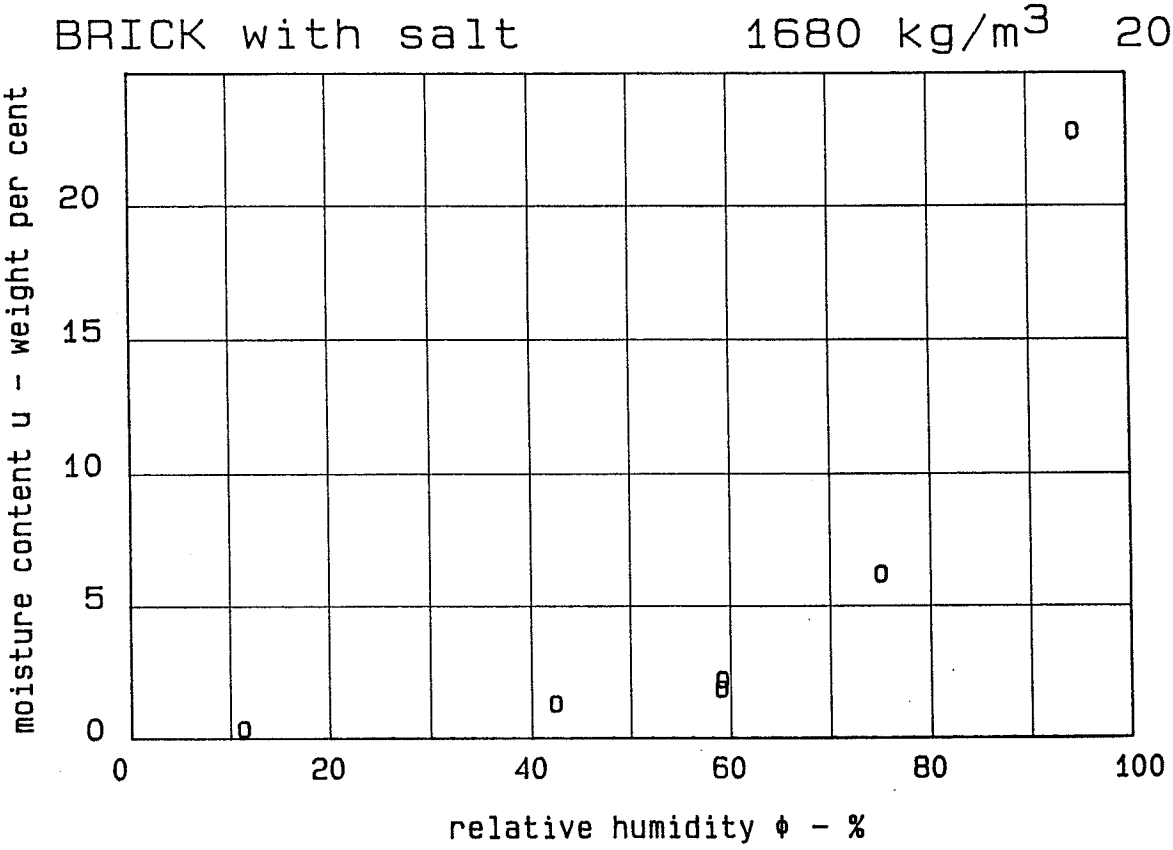
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: brick

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	11.3	42.3	59.0	59.1	75.0	94.6
u	0.4	1.3	1.9	2.2	6.2	22.8

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

No scanning values

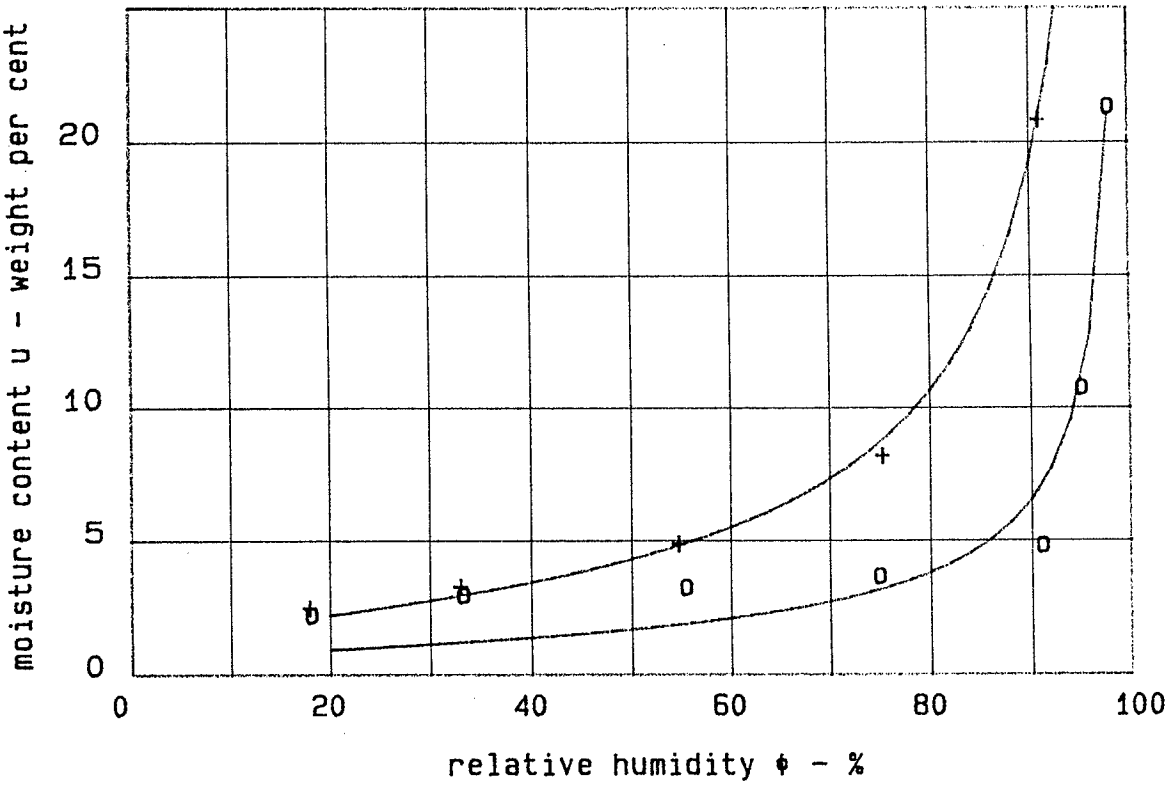
Notes: From Alslev church.

Litterature: Nielsen, Anders: Undersoegelse af teglproever fra Alslev kirke. Laboratoriet for Bygnings-materialer. DTH. 1985.

Date: 14- 4-86 Initials: KKH File: \a_b\bricksa

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CELLULAR CONCRETE 230 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 90.9 75.2 54.7 33.0 17.9
u 20.8 8.2 4.9 3.3 2.5
Approximation:
u= 2.51E+02*exp((-1/1.24)*ln(1-ln(ϕ)/ 4.52E-03))

o measured adsorption values

ϕ 18.1 33.3 55.5 74.9 91.1 95.0 98.0
u 2.2 3.0 3.2 3.7 4.8 10.7 21.3
Approximation:
u= 2.65E+02*exp((-1/1.39)*ln(1-ln(ϕ)/ 6.14E-04))

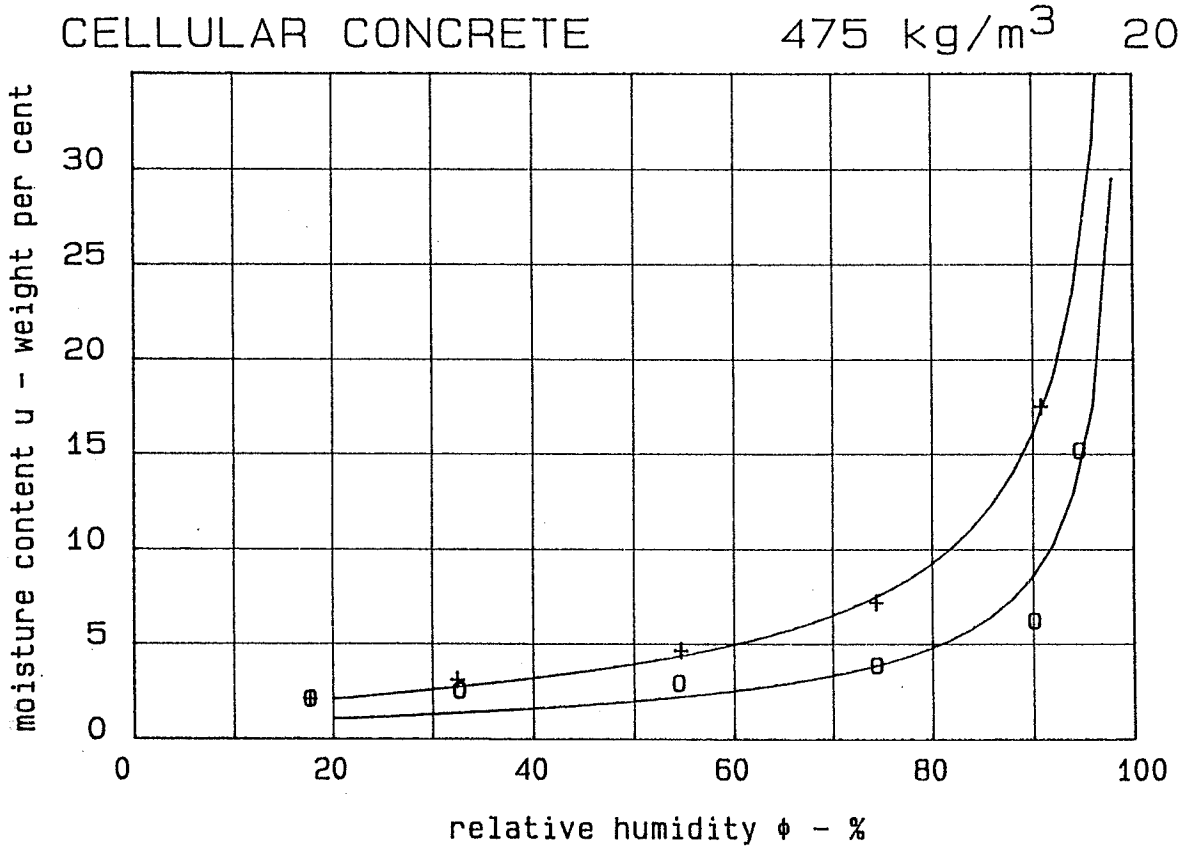
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: CELCON20.230

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	90.8	74.3	54.6	32.5	17.6
u	17.5	7.2	4.6	3.1	2.1

Approximation:
u= 1.64E+02*exp((-1/1.31)*ln(1-ln(ϕ)/ 5.30E-03))

o measured adsorption values

ϕ	17.6	32.7	54.4	74.4	90.1	94.6
u	2.1	2.5	2.9	3.9	6.2	15.2

Approximation:
u= 2.00E+02*exp((-1/1.28)*ln(1-ln(ϕ)/ 1.91E-03))

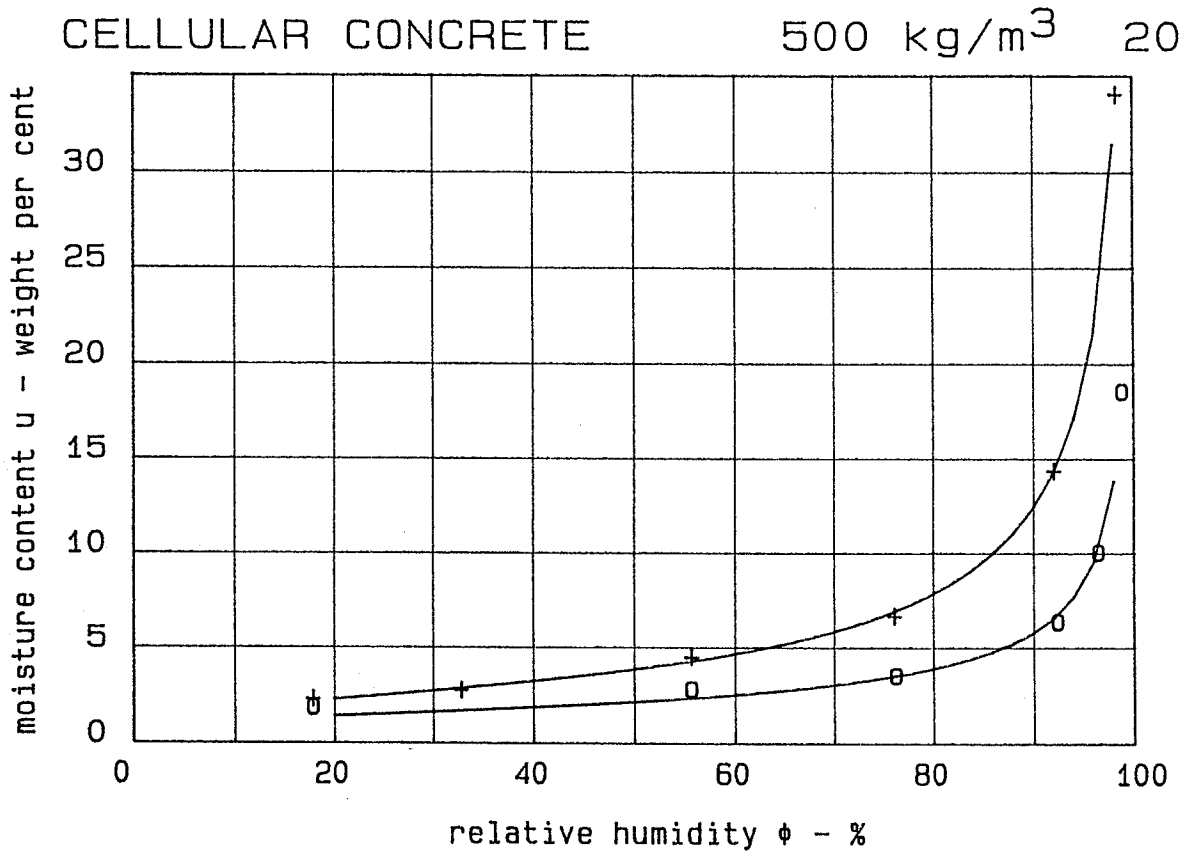
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: celcon20.475

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	98.3	92.0	76.1	55.6	32.8	17.8
u	34.1	14.4	6.7	4.5	2.7	2.3

Approximation:
u= 8.29E+01*exp((-1/1.57)*ln(1-ln(ϕ)/ 5.65E-03))

o measured adsorption values

ϕ	17.8	55.7	76.3	92.4	96.5	98.8
u	1.8	2.8	3.5	6.4	10.0	18.5

Approximation:
u= 1.23E+02*exp((-1/1.89)*ln(1-ln(ϕ)/ 3.31E-04))

No scanning values

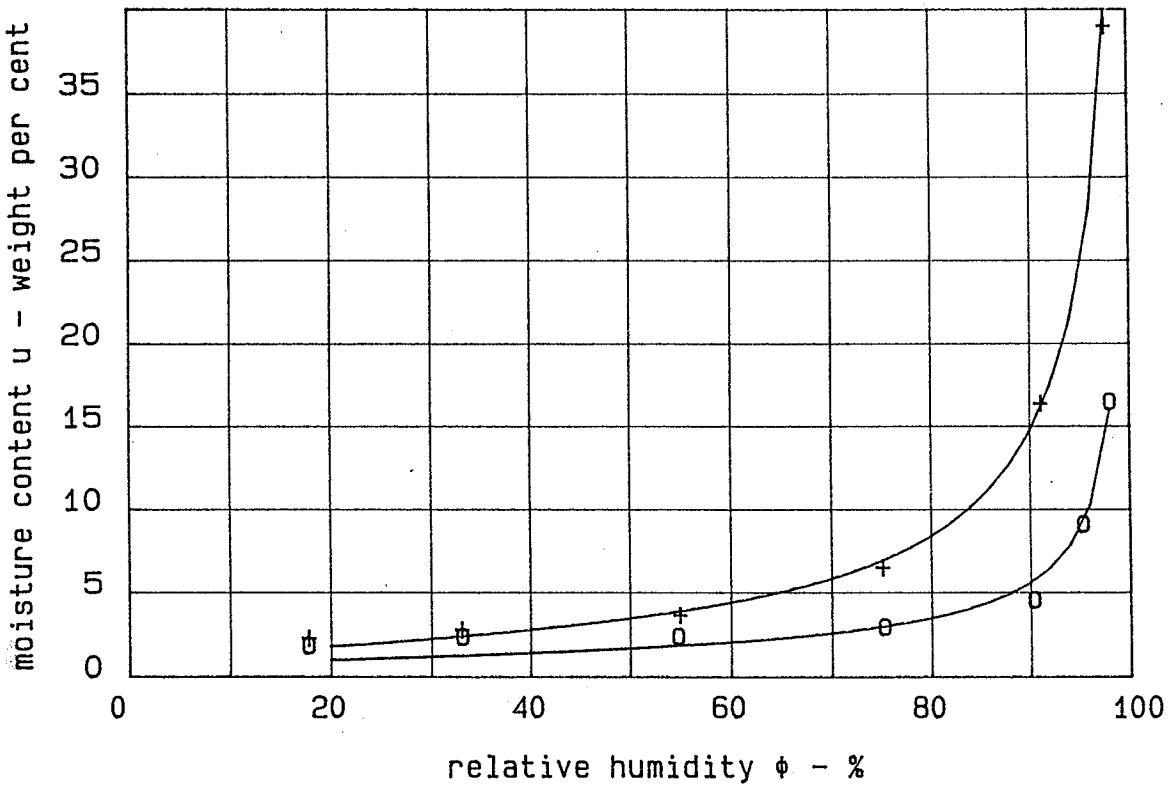
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: celcon20.500

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CELLULAR CONCRETE 500 kg/m^3 20.0°C



\+ measured desorption values

ϕ	97.7	91.1	75.1	54.9	33.1	17.8
u	39.0	16.4	6.5	3.6	2.8	2.3

Approximation:
u= 9.27E+01*exp((-1/1.24)*ln(1-ln(ϕ)/ 1.20E-02))

o measured adsorption values

ϕ	17.8	33.1	54.8	75.3	90.3	95.3	98.0
u	1.8	2.3	2.4	2.9	4.6	9.1	16.5

Approximation:
u= 1.60E+02*exp((-1/1.56)*ln(1-ln(ϕ)/ 5.72E-04))

No scanning values

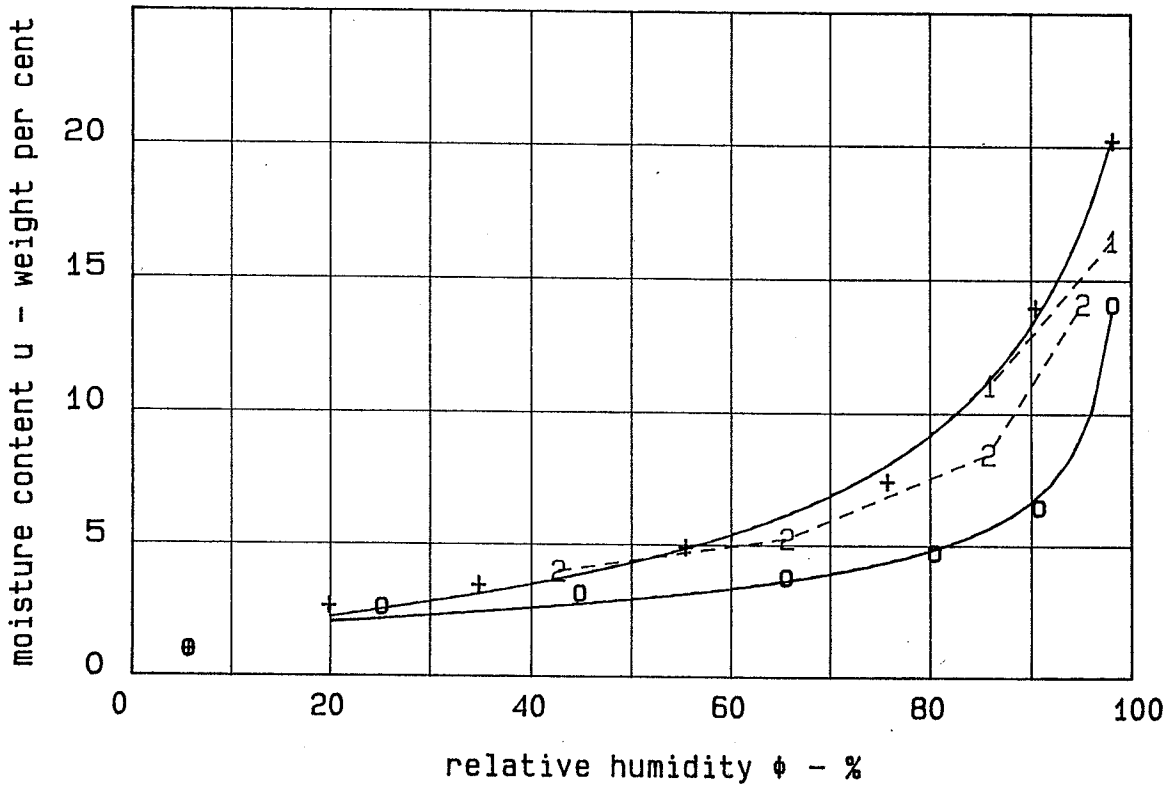
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: celcon20.501

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CELLULAR CONCRETE 510 kg/m^3 20.0°C



\+ measured desorption values

ϕ	98.1	90.3	75.6	55.3	34.7	19.8	5.7
u	20.2	13.9	7.4	4.9	3.5	2.7	1.0

Approximation:
u= 2.32E+01*exp((-1/1.15)*ln(1-ln(ϕ)/ 1.18E-01))

o measured adsorption values

ϕ	5.7	25.1	44.7	65.5	80.4	90.7	98.1
u	1.0	2.6	3.2	3.8	4.7	6.5	14.1

Approximation:
u= 7.88E+01*exp((-1/2.29)*ln(1-ln(ϕ)/ 3.75E-04))

1 measured scanning values

ϕ	98.1	85.8
u	16.5	11.1

2 measured scanning values

ϕ	42.6	65.6	85.7	95.1
u	4.0	5.3	8.5	14.1

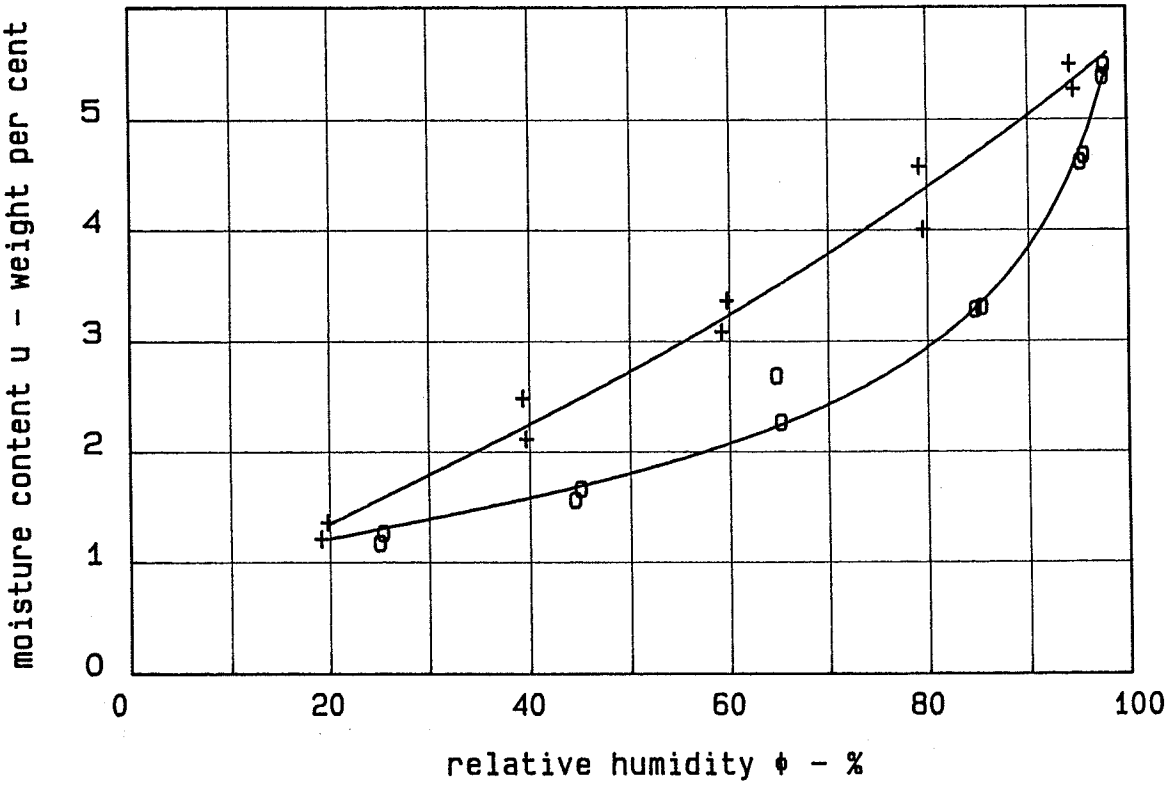
Notes: Open porosity 79%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: \c\celcon20.510

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CEMENTMORTAR w/c=0.70 2000 kg/m^3 20.0°C



\+ measured desorption values

ϕ	94.2	94.6	79.2	79.6	59.7	59.2	39.3	39.7	19.8	19.1
u	5.49	5.27	4.57	4.00	3.36	3.08	2.48	2.11	1.36	1.21

Approximation:
u= 5.74E+00*exp((-1/0.47)*ln(1-ln(ϕ)/ 1.67E+00))

o measured adsorption values

ϕ	25.1	25.4	44.5	45.1	65.2	64.8	84.7	85.4	95.2	95.6	97.6	97.7
u	1.17	1.26	1.56	1.66	2.26	2.68	3.28	3.30	4.61	4.67	5.38	5.48

Approximation:
u= 6.29E+00*exp((-1/1.99)*ln(1-ln(ϕ)/ 6.30E-02))

No scanning values

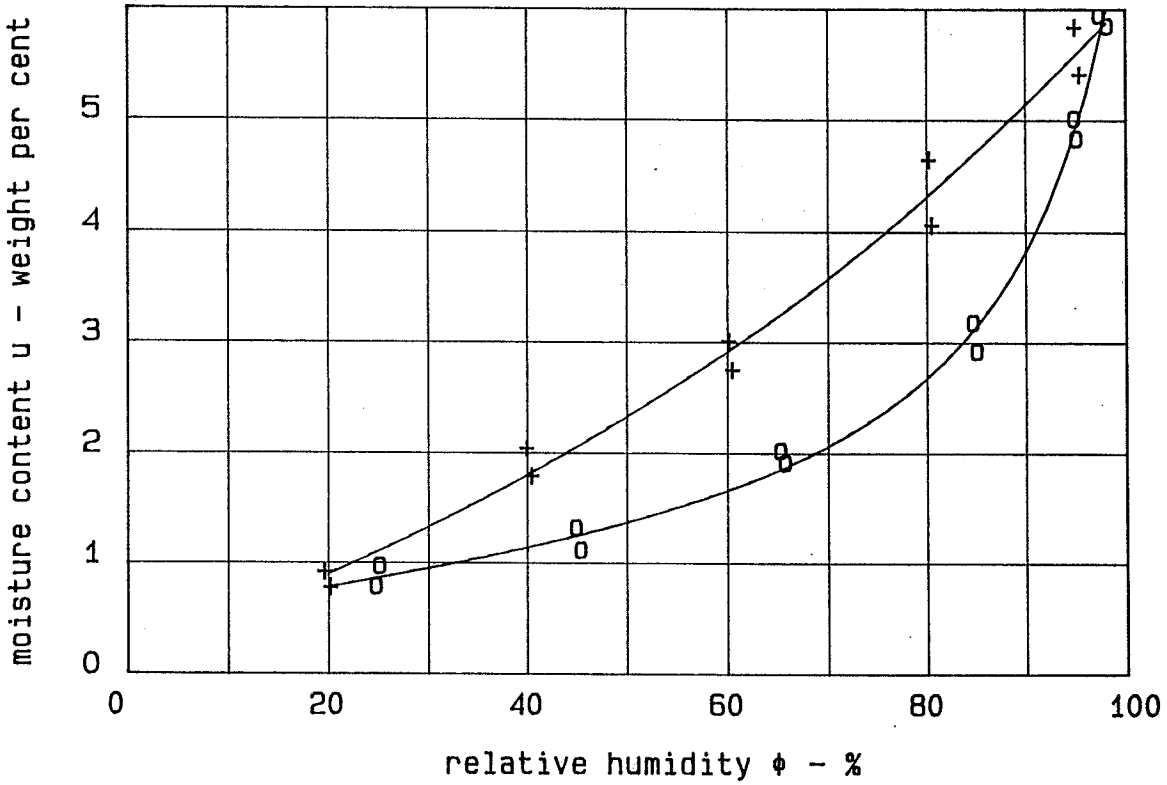
Notes: Cement mortar 1: 4, w/c=0.70, wn/C=0.20.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \C\CEMMOR20.070

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CEMENTMORTAR w/c=0.80 2000 kg/m^3 20.0°C



\+ measured desorption values

ϕ 94.9 95.4 80.1 80.4 60.0 60.4 39.9 40.4 19.5 20.1
u 5.84 5.41 4.64 4.06 3.01 2.75 2.04 1.79 0.92 0.78
Approximation:
u= 6.07E+00*exp((-1/0.31)*ln(1-ln(ϕ)/ 2.05E+00))

o measured adsorption values

ϕ 24.7 25.0 45.3 44.8 65.6 65.1 85.0 84.6 95.1 94.9 98.1 97.3
u 0.79 0.97 1.12 1.32 1.91 2.02 2.92 3.18 4.83 5.01 5.85 5.95
Approximation:
u= 7.05E+00*exp((-1/1.40)*ln(1-ln(ϕ)/ 7.83E-02))

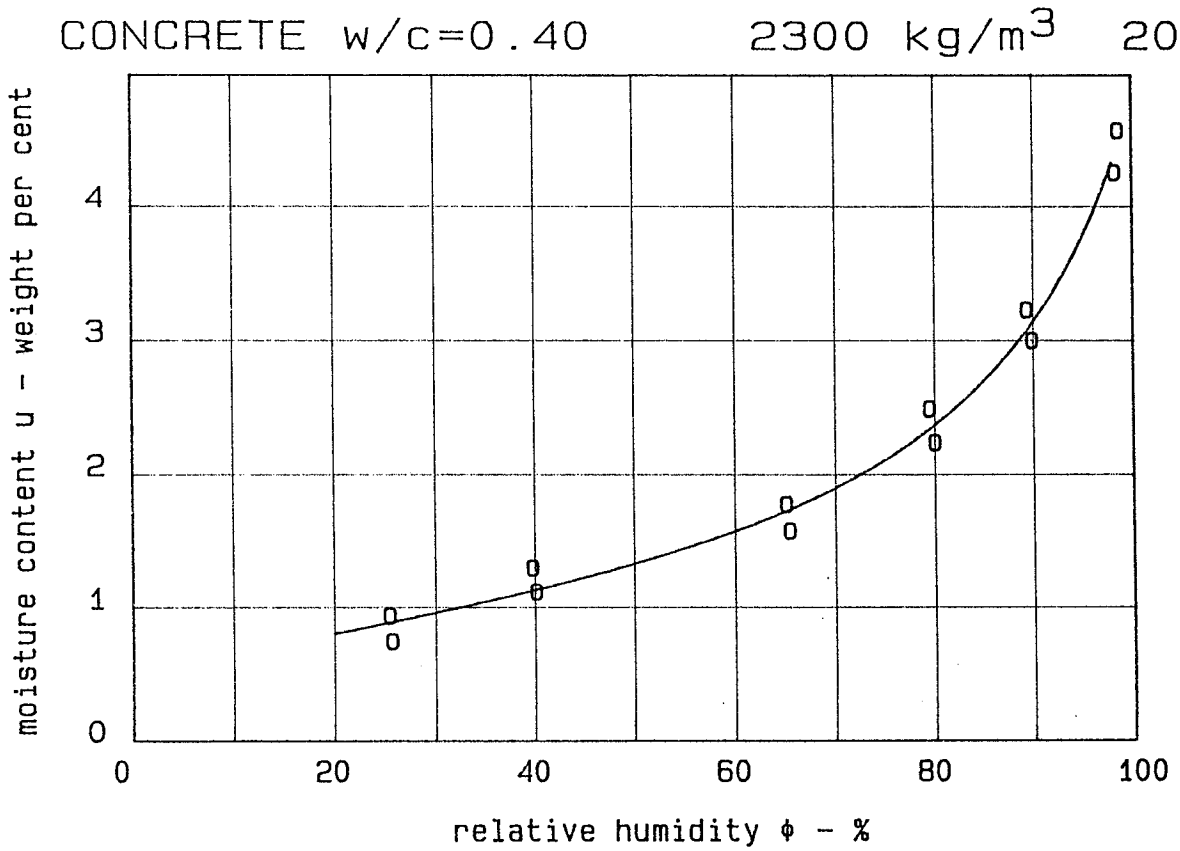
No scanning values

Notes: Cement mortar 1:4, w/c=0.80, open porosity=22%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \c\cemmor20.080

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	25.6	25.4	40.1	39.8	65.4	65.0	80.0	79.4	89.8	89.3	98.2	98.6
u	0.75	0.94	1.12	1.30	1.58	1.78	2.24	2.49	3.00	3.23	4.26	4.58

Approximation:
u= 4.82E+00*exp((-1/1.51)*ln(1-ln(ϕ)/ 1.17E-01))

No scanning values

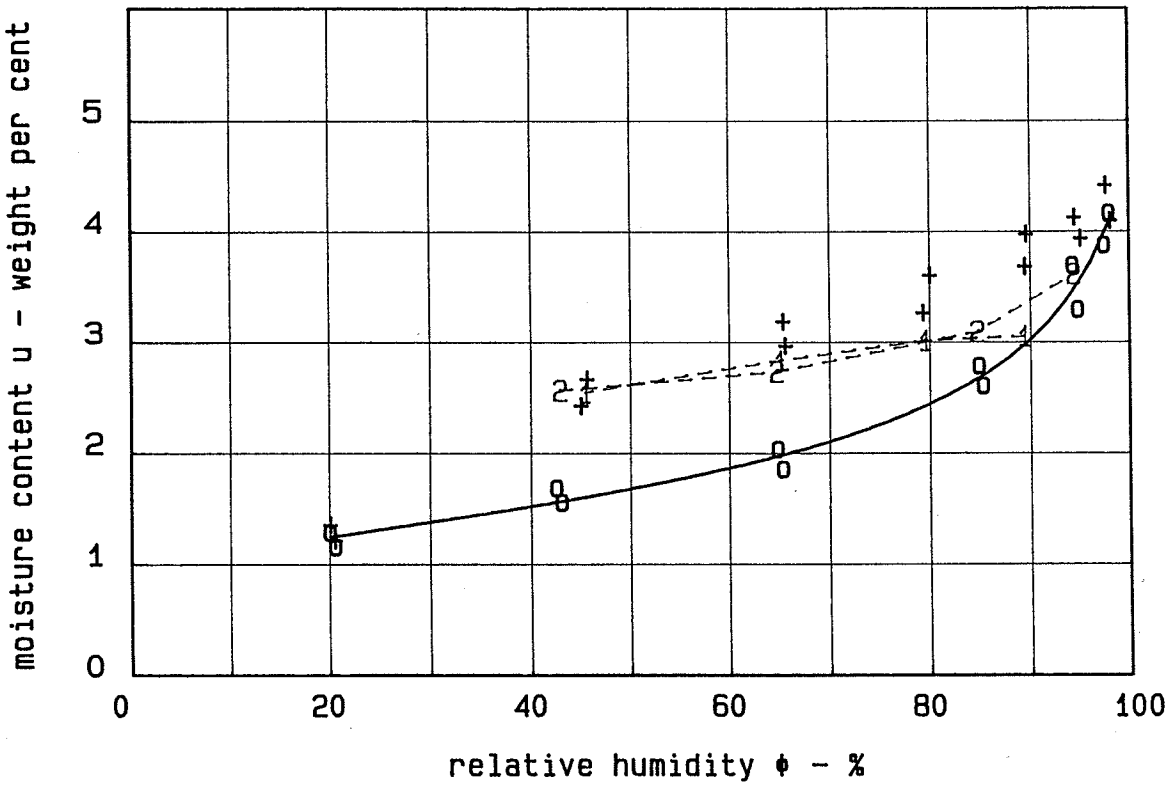
Notes: Concrete K 500 P, C=502 kg/m3, w/c=0.40, wn/C=0.15
lo=2%, max size of stones=32 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: concre20.040

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CONCRETE w/c=0.44 2300 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 97.6 98.1 94.4 95.1 89.6 89.4 80.0 79.3 65.3 65.6 45.6 45.0 20.0 20.5
u 4.41 4.09 4.12 3.93 3.97 3.68 3.60 3.26 3.18 2.96 2.66 2.42 1.35 1.21
Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

o measured adsorption values

ϕ 20.5 20.0 43.0 42.5 65.3 64.8 85.2 84.8 94.8 94.2 97.5 98.0
u 1.15 1.28 1.55 1.68 1.85 2.03 2.60 2.78 3.29 3.69 3.87 4.16
Approximation:
u= 4.65E+00*exp((-1/2.67)*ln(1-ln(ϕ)/ 4.89E-02))

1 measured scanning values

ϕ 89.4 79.5 65.1 45.4
u 3.05 3.01 2.83 2.54

2 measured scanning values

ϕ 42.9 64.7 84.7 94.4
u 2.56 2.73 3.09 3.61

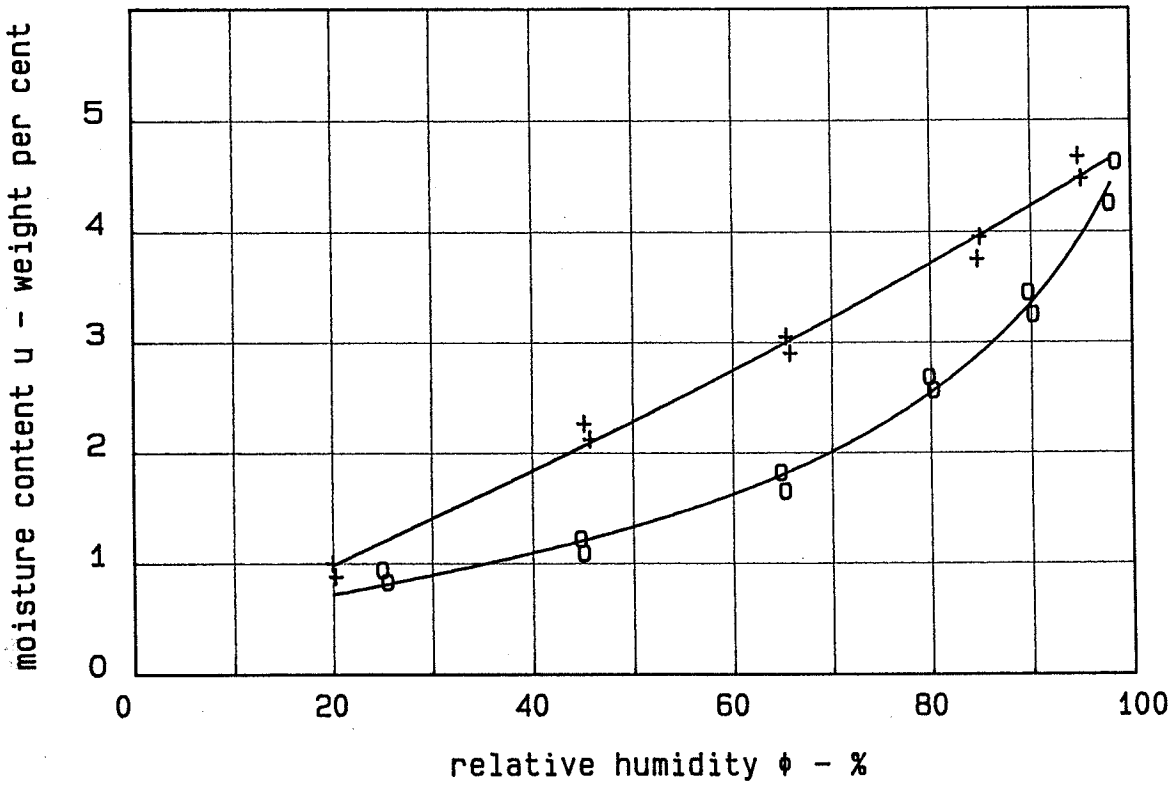
Notes: Concrete K 350 P, C=334 kg/m3, std., w/c=0.44, wn/C=0.24 , lo=4.3%, max size of stones=32 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \C\CONCRE20.044

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CONCRETE w/c=0.48 2300 kg/m^3 20.0°C



\+ measured desorption values

ϕ	94.7	95.0	84.9	84.6	65.3	65.8	45.1	45.7	19.9	20.2
u	4.67	4.47	3.95	3.75	3.05	2.90	2.26	2.12	1.00	0.88

Approximation:
u= 4.76E+00*exp((-1/0.18)*ln(1-ln(ϕ)/ 4.85E+00))

o measured adsorption values

ϕ	25.5	25.0	45.1	44.7	65.2	64.8	80.2	79.8	90.1	89.6	97.8	98.5
u	0.83	0.94	1.09	1.22	1.65	1.82	2.56	2.68	3.25	3.45	4.25	4.62

Approximation:
u= 4.79E+00*exp((-1/1.13)*ln(1-ln(ϕ)/ 2.14E-01))

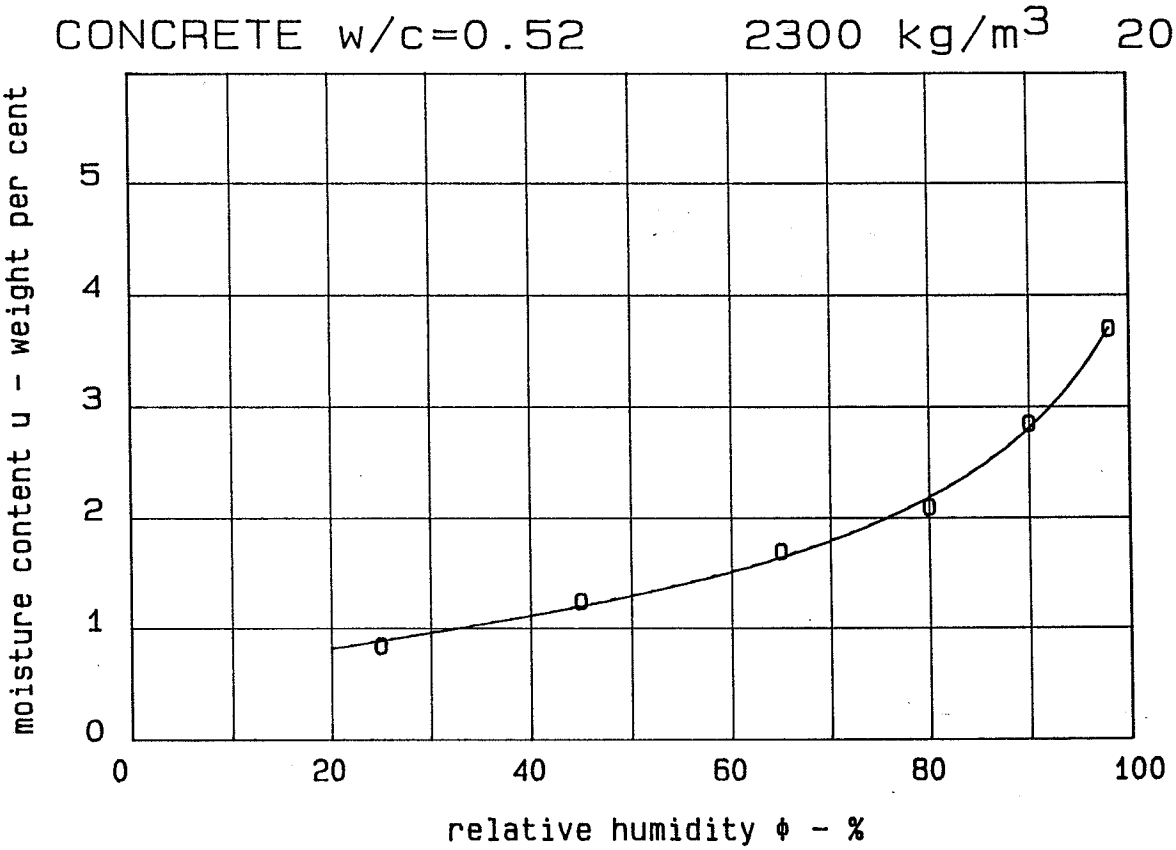
No scanning values

Notes: Concrete K 300 P, C=320 kg/m3, std, w/c=0.48, wn/C=0.20, lo=3,9%, max size of stones=32 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \C\CONCRE20.048

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	25.0	45.0	65.0	80.0	90.0	98.0
u	0.85	1.25	1.70	2.10	2.85	3.70

Approximation:
u= 4.05E+00*exp((-1/1.63)*ln(1-ln(ϕ)/ 1.30E-01))

No scanning values

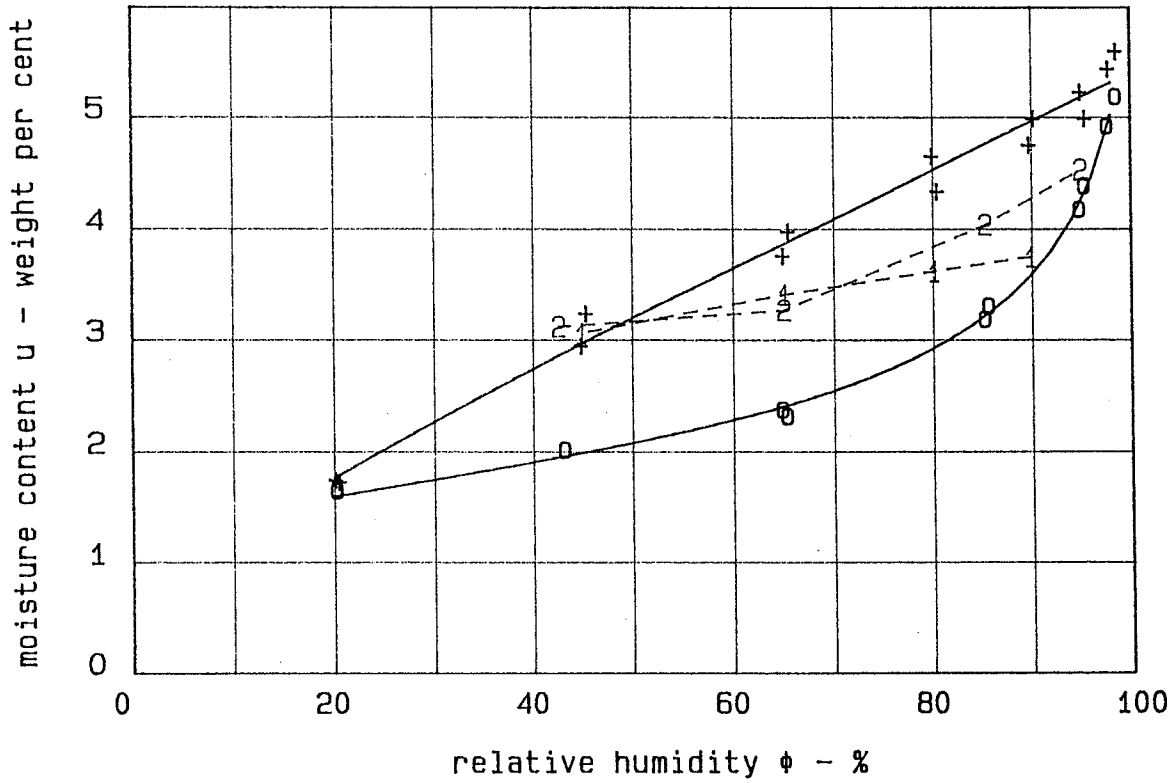
Notes: C=300 kg/m3, w/c=0.52, wn/c=0.22.

Litterature: Bergstroem, S. G., Ahlgren, L.: Calculation of Absorption Isotherms for Concrete. NORDISK BETONG 1969: 2.

Date: 18- 4-86 Initials: KKH File: \C\CONCRE20.052

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CONCRETE w/c=0.55 2300 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 98.5 97.7 94.9 95.4 90.2 89.7 79.9 80.5 65.4 64.9 45.3 44.9 20.1 20.5
u 5.60 5.44 5.23 4.99 4.99 4.75 4.65 4.34 3.98 3.76 3.24 2.95 1.75 1.73
Approximation:
u= 5.41E+00*exp((-1/0.27)*ln(1-ln(ϕ)/ 4.51E+00))

o measured adsorption values

ϕ 20.3 43.2 65.3 64.8 85.2 85.6 94.8 95.2 97.6 98.5
u 1.65 2.02 2.32 2.38 3.19 3.31 4.18 4.39 4.92 5.19
Approximation:
u= 6.03E+00*exp((-1/3.11)*ln(1-ln(ϕ)/ 2.65E-02))

1 measured scanning values

ϕ 89.9 80.1 65.0 44.9
u 3.75 3.62 3.41 3.06

2 measured scanning values

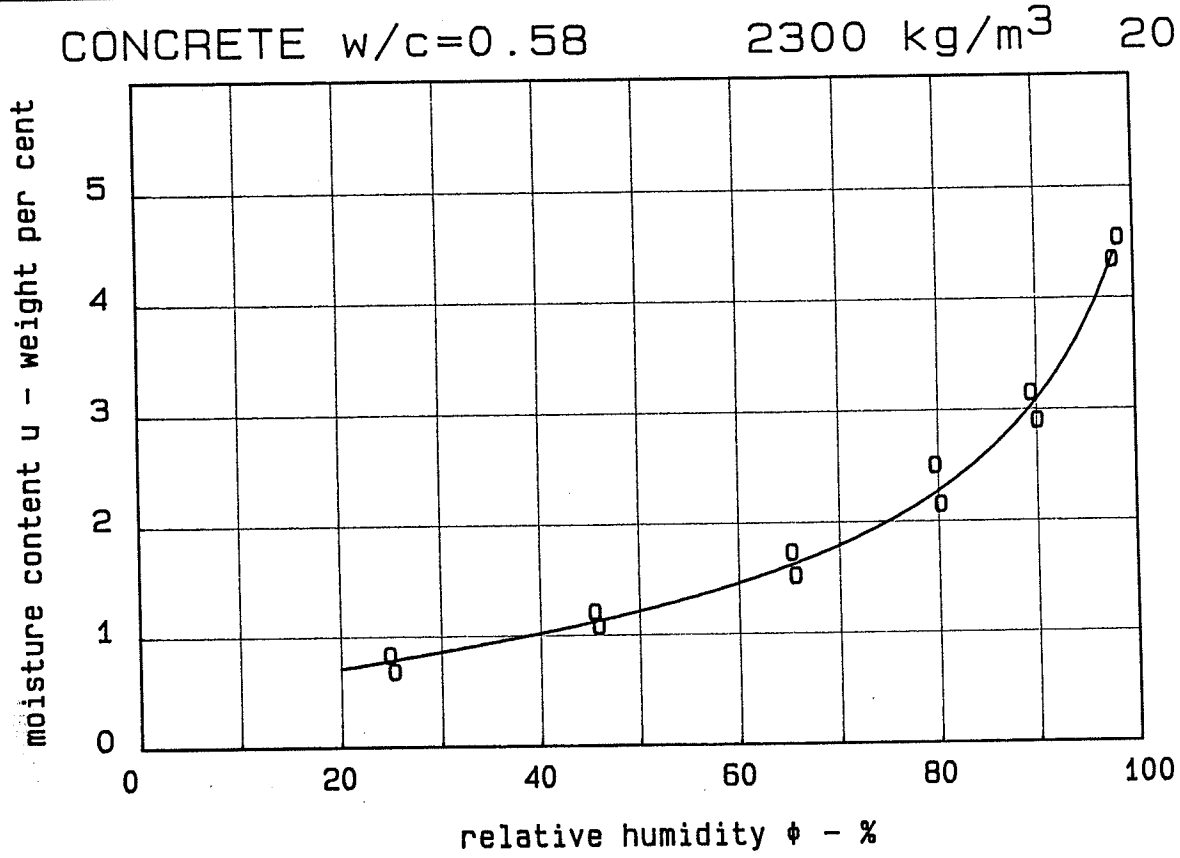
ϕ 42.5 65.0 85.2 94.8
u 3.12 3.27 4.04 4.53

Notes: CONCRETE, C=400 kg/m3, w/c=0.55, wn/C=0.23
lo=5.3%, max size of stones=32 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: concre20.055

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	25.3	24.9	45.9	45.5	65.6	65.3	80.2	79.7	90.1	89.4	97.9	98.5
u	0.68	0.83	1.08	1.21	1.52	1.73	2.15	2.50	2.90	3.15	4.34	4.54

Approximation:
u= 4.93E+00*exp((-1/1.40)*ln(1-ln(ϕ)/ 1.14E-01))

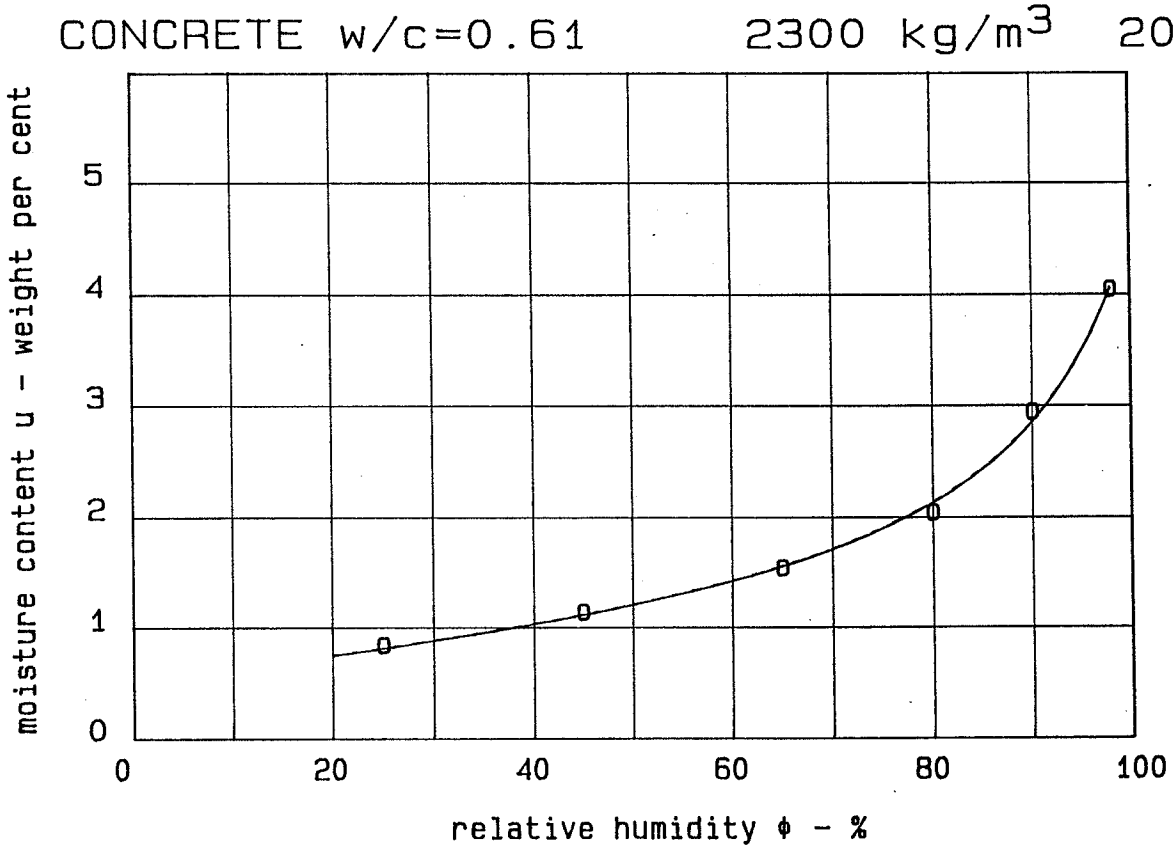
No scanning values

Notes: Concrete K 300 P, C=306 kg/m3, std., w/c=0.58, wn/C=0.16, lo=1.9%, max size of stones=32 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \C\CONCRE20.058

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ 25.0 45.0 65.0 80.0 90.0 98.0
u 0.85 1.15 1.55 2.05 2.95 4.05
Approximation:
u= 4.60E+00*exp((-1/1.62)*ln(1-ln(ϕ)/ 9.13E-02))

No scanning values

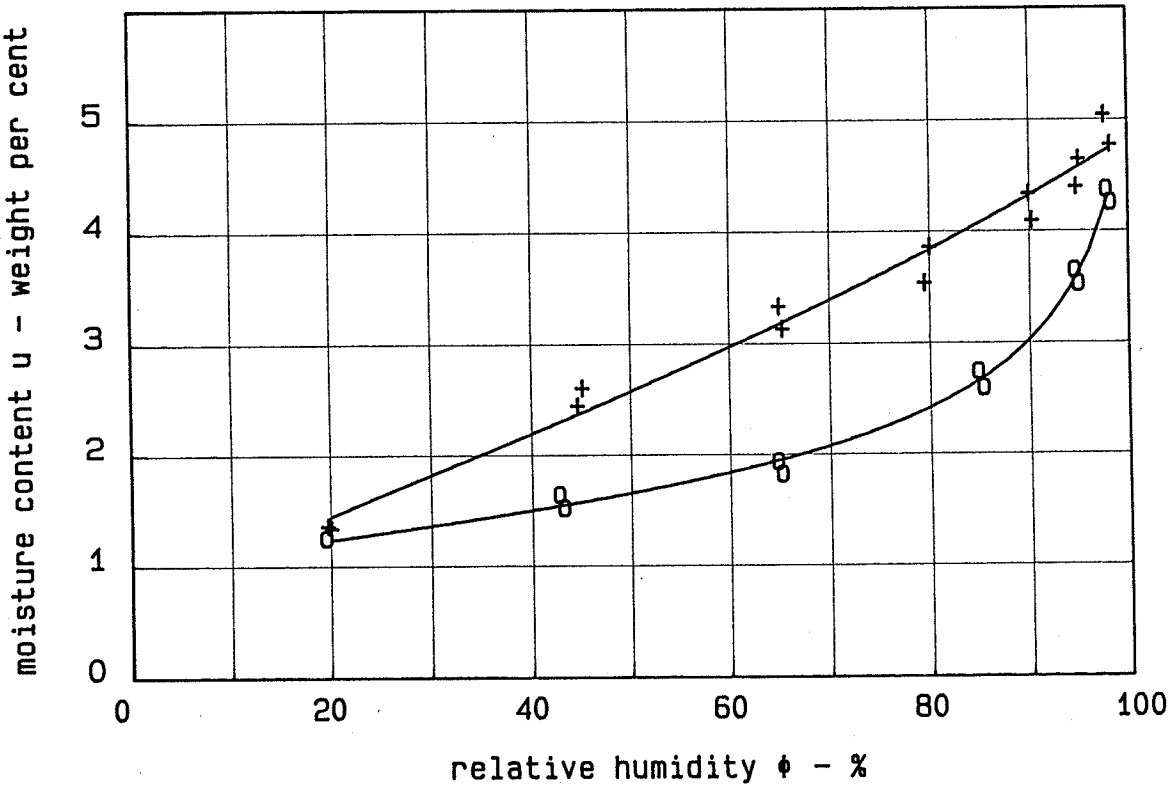
Notes: C=280 kg/m3, v/c=0.61, wn/C=0.205.

Litterature: Bergstroem, S. G., Ahlgren, L.: Calculation of Absorption Isotherms for Concrete. NORDISK BETONG 1969: 2.

Date: 18- 4-86 Initials: KKH File: \C\CONCRE20.061

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CONCRETE w/c=0.65 2300 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	97.6	98.2	95.0	94.7	89.9	90.3	80.0	79.5	64.9	65.3	45.1	44.6	19.7	20.1
u	5.04	4.77	4.64	4.39	4.33	4.09	3.86	3.54	3.33	3.13	2.60	2.44	1.36	1.34

Approximation:
u= 4.84E+00*exp((-1/0.62)*ln(1-ln(ϕ)/ 1.45E+00))

o measured adsorption values

ϕ	19.5	43.2	42.7	65.2	64.8	85.3	84.8	94.9	94.5	98.2	97.8
u	1.25	1.52	1.64	1.82	1.93	2.59	2.74	3.53	3.65	4.25	4.37

Approximation:
u= 5.16E+00*exp((-1/2.76)*ln(1-ln(ϕ)/ 3.14E-02))

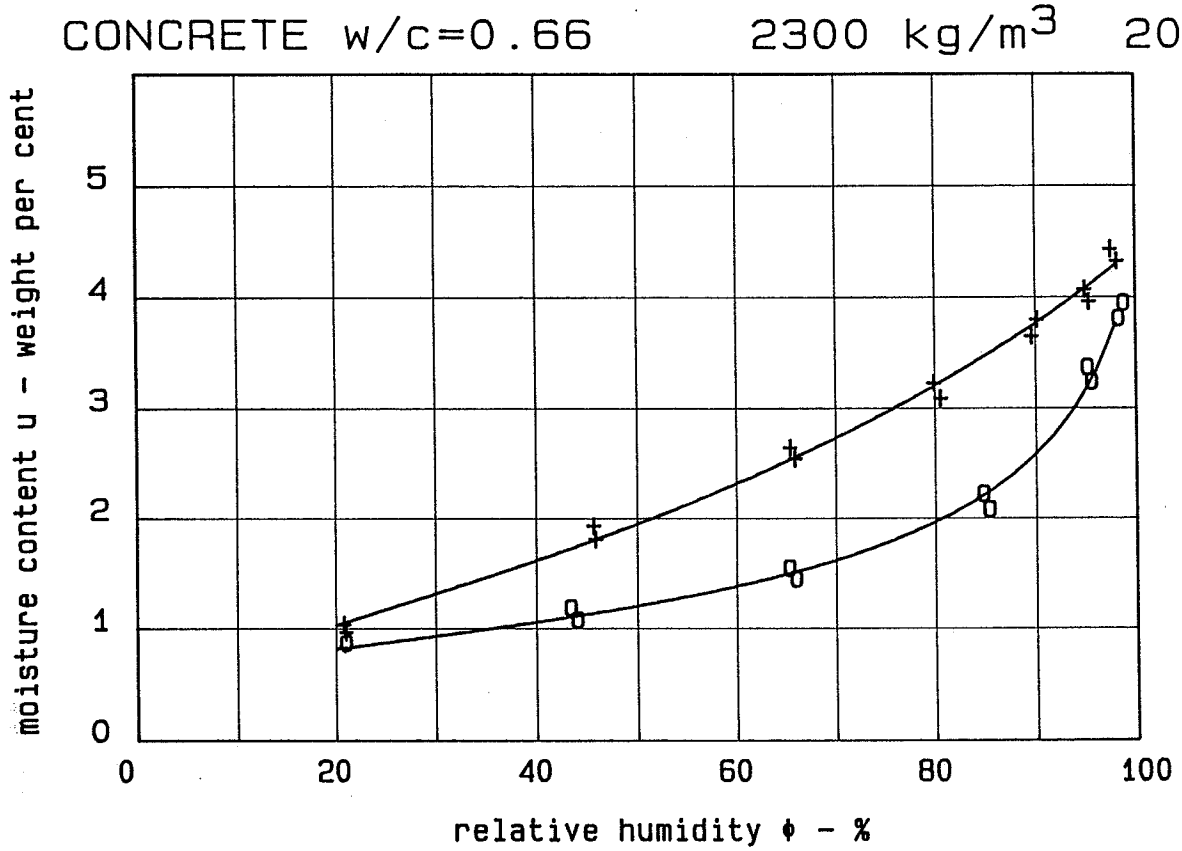
No scanning values

Notes: Concrete K 250 P, C=284 kg/m3, std., w/c=0.65, wn/C=0.24, lo=0.24, max size of stones=32 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \C\CONCRE20.065

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	97.5	98.2	94.9	95.3	90.1	89.6	79.9	80.6	65.4	65.9	45.7	45.9	20.8	21.0
u	4.43	4.32	4.07	3.96	3.80	3.65	3.23	3.09	2.64	2.54	1.93	1.81	1.04	0.97

Approximation:
u= 4.43E+00*exp((-1/0.74)*ln(1-ln(ϕ)/ 8.24E-01))

o measured adsorption values

ϕ	21.0	44.0	43.4	66.0	65.3	85.4	84.8	95.6	95.1	98.3	98.8
u	0.87	1.08	1.19	1.45	1.55	2.08	2.22	3.24	3.37	3.81	3.95

Approximation:
u= 4.40E+00*exp((-1/2.04)*ln(1-ln(ϕ)/ 5.37E-02))

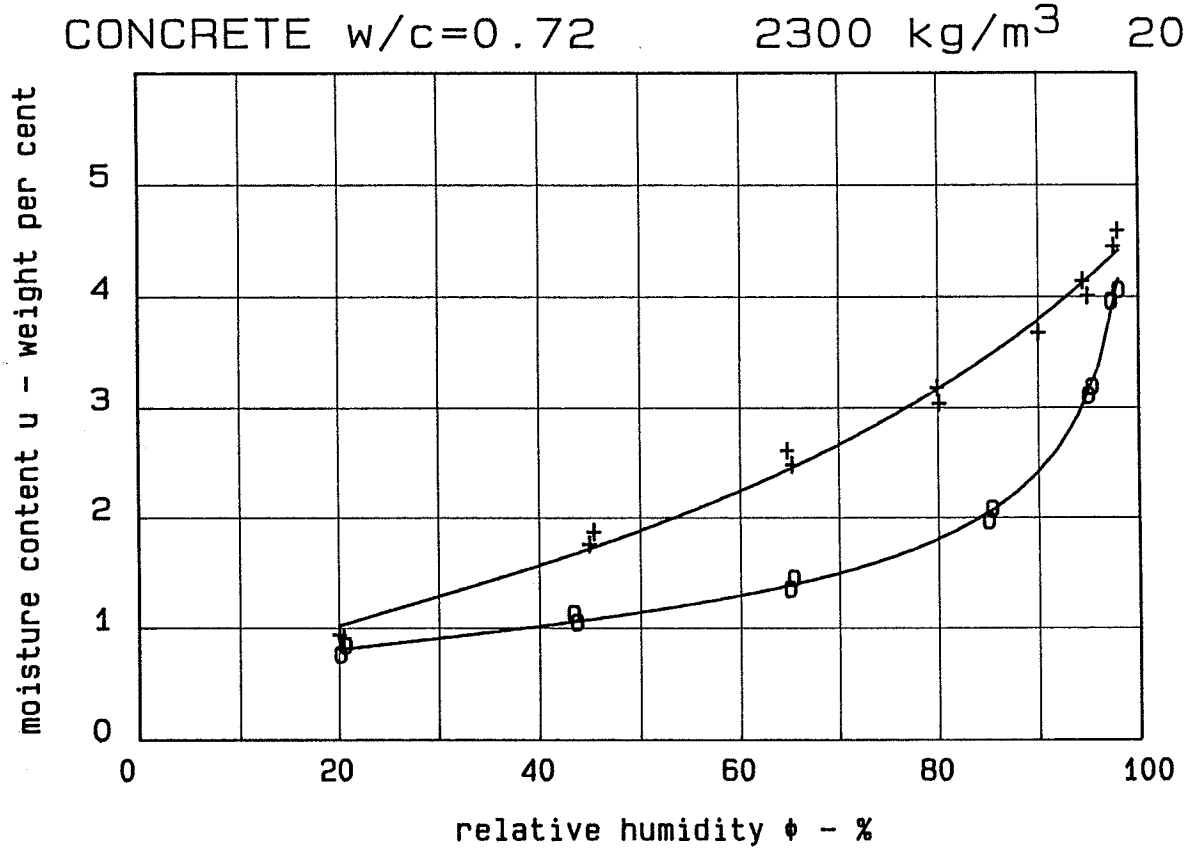
No scanning values

Notes: Concrete K 200 P, C=237 kg/m3, std., w/c=0.66, wn/C=0.24, lo=5.8%, max size of stones=32 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \C\CONCRE20.066

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	97.9	97.5	94.4	94.9	90.0	90.0	79.9	80.1	64.7	65.3	45.4	44.9	20.0	20.5
u	4.59	4.45	4.14	4.01	3.68	3.68	3.18	3.04	2.61	2.48	1.87	1.76	0.94	0.91

Approximation:
u= 4.59E+00*exp((-1/0.89)*ln(1-ln(ϕ)/ 5.74E-01))

o measured adsorption values

ϕ	20.1	20.6	43.7	43.4	65.0	65.4	85.0	85.4	95.0	95.4	97.3	98.0
u	0.76	0.84	1.05	1.13	1.35	1.45	1.97	2.08	3.11	3.19	3.96	4.06

Approximation:
u= 6.33E+00*exp((-1/2.40)*ln(1-ln(ϕ)/ 1.16E-02))

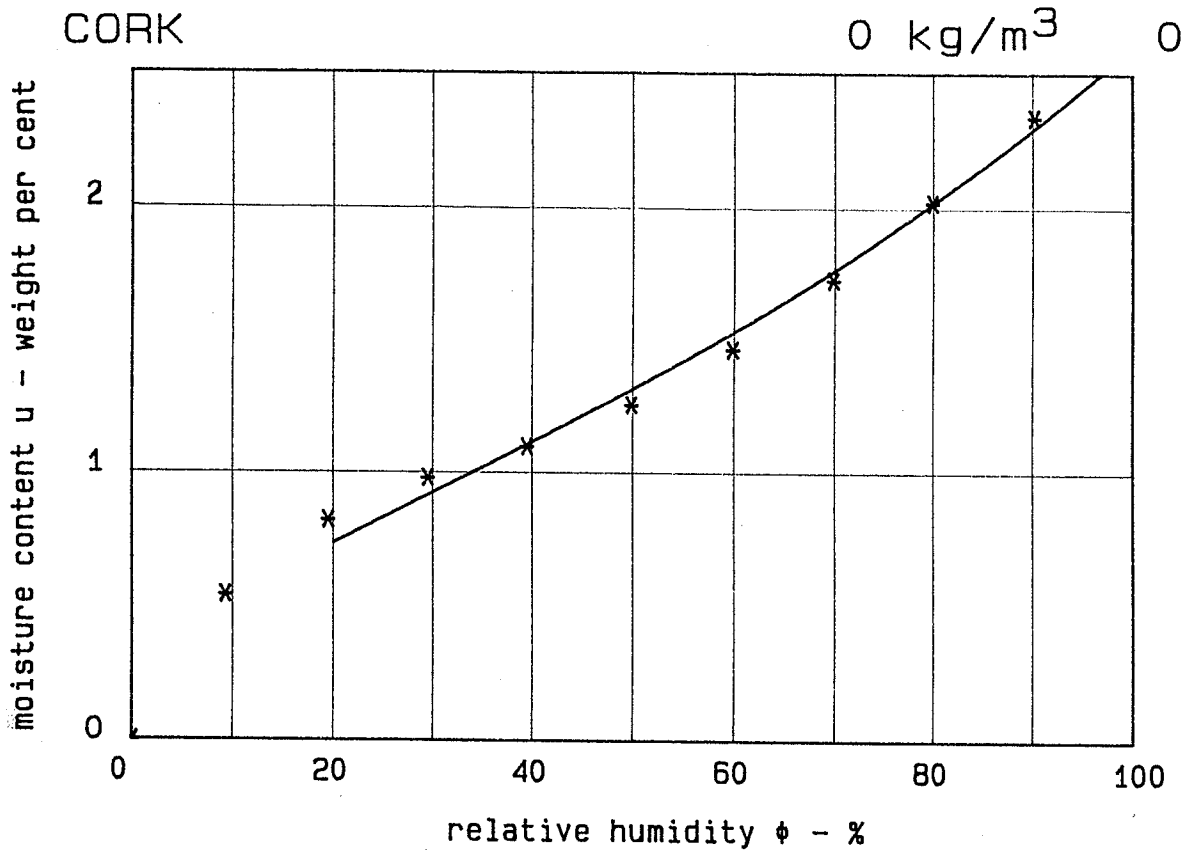
No scanning values

Notes: Concrete K 150 P, C=220 kg/m3, std., w/c=0.72, wn/C=0.24, lo=4,5%, max size of stones=32 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \C\CONCRE20.072

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.1	9.4	19.5	29.5	39.5	49.9	59.8	69.9	79.9	90.2
u	0.00	0.54	0.82	0.98	1.10	1.26	1.47	1.73	2.02	2.34

Approximation:

u= 2.60E+00*exp((-1/0.66)*ln(1-ln(ϕ)/ 1.23E+00))

No scanning values

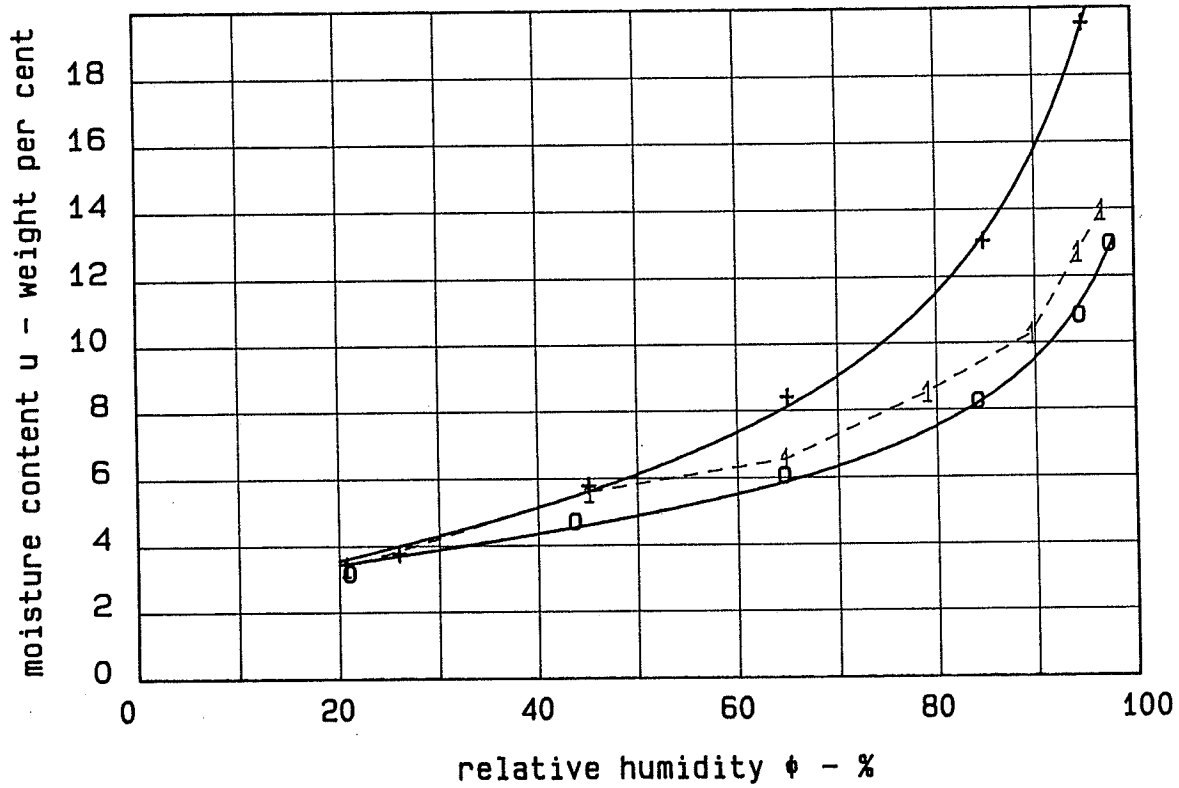
Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: cork

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

CORK AND CORK MEAL 200 kg/m^3 20.0°C



\+ measured desorption values

ϕ 95.1 84.8 65.0 45.1 26.0
u 19.5 13.1 8.4 5.8 3.8
Approximation:
u= 2.56E+01*exp((-1/1.40)*ln(1-ln(ϕ)/ 1.08E-01))

o measured adsorption values

ϕ 21.0 43.7 64.6 84.1 94.5 97.6
u 3.2 4.7 6.1 8.3 10.8 13.0
Approximation:
u= 1.49E+01*exp((-1/2.26)*ln(1-ln(ϕ)/ 6.04E-02))

1 measured scanning values

ϕ 96.8 94.3 89.6 79.0 64.7 45.1 20.7
u 13.9 12.7 10.3 8.5 6.5 5.6 3.4

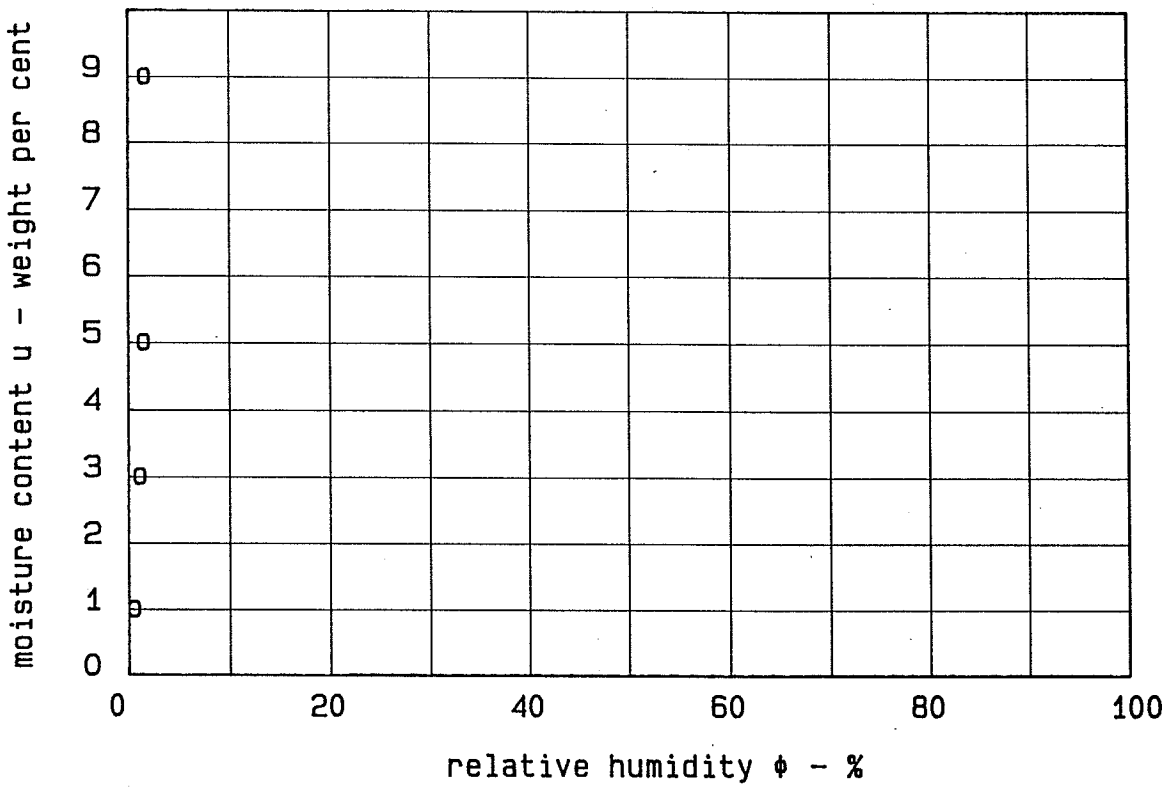
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \C\CORK020.200

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

MAGNESIUMPERCHLORATE 800 kg/m^3 23.0°C



o measured adsorption values

ϕ	0.5	1.1	1.5	1.6
u	1.00	3.00	5.00	9.00

Approximation:
u= 0.00E+00*exp((-1/0.00)*ln(1-ln(ϕ)/ 0.00E+00))

No scanning values

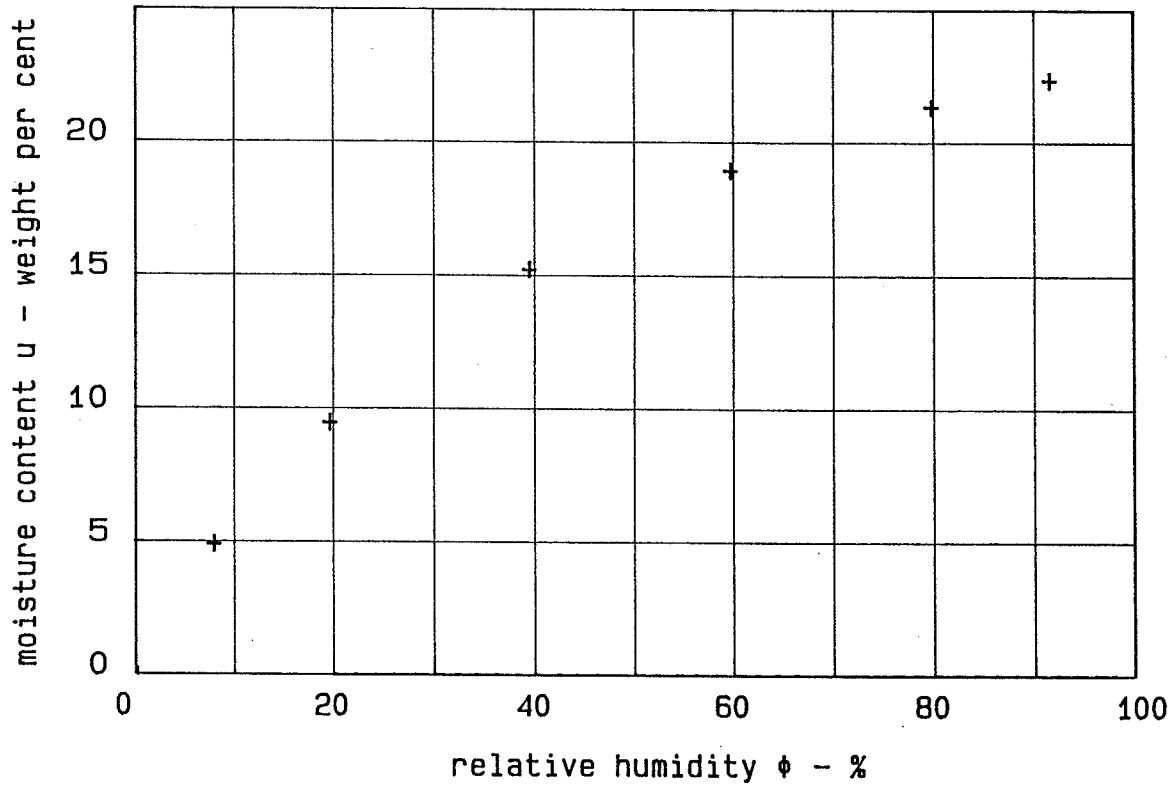
Notes:

Litterature: Bertelsen, Niels Haldor: Diffusionsmaaling med kopmetoden paa roedgran. Build. Mat. Lab., Techn. Univ. of Den., Rep. 129/83. 1984.

Date: 18- 4-86 Initials: KKH File: \m_u\magnespe.800

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

SILICAGEL inorganic 0 kg/m^3 0.0°C



\+ measured desorption values

ϕ	91.5	79.7	59.7	39.4	19.6	7.9	0.2
u	22.4	21.4	18.9	15.2	9.5	4.9	-0.1

Approximation:

u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

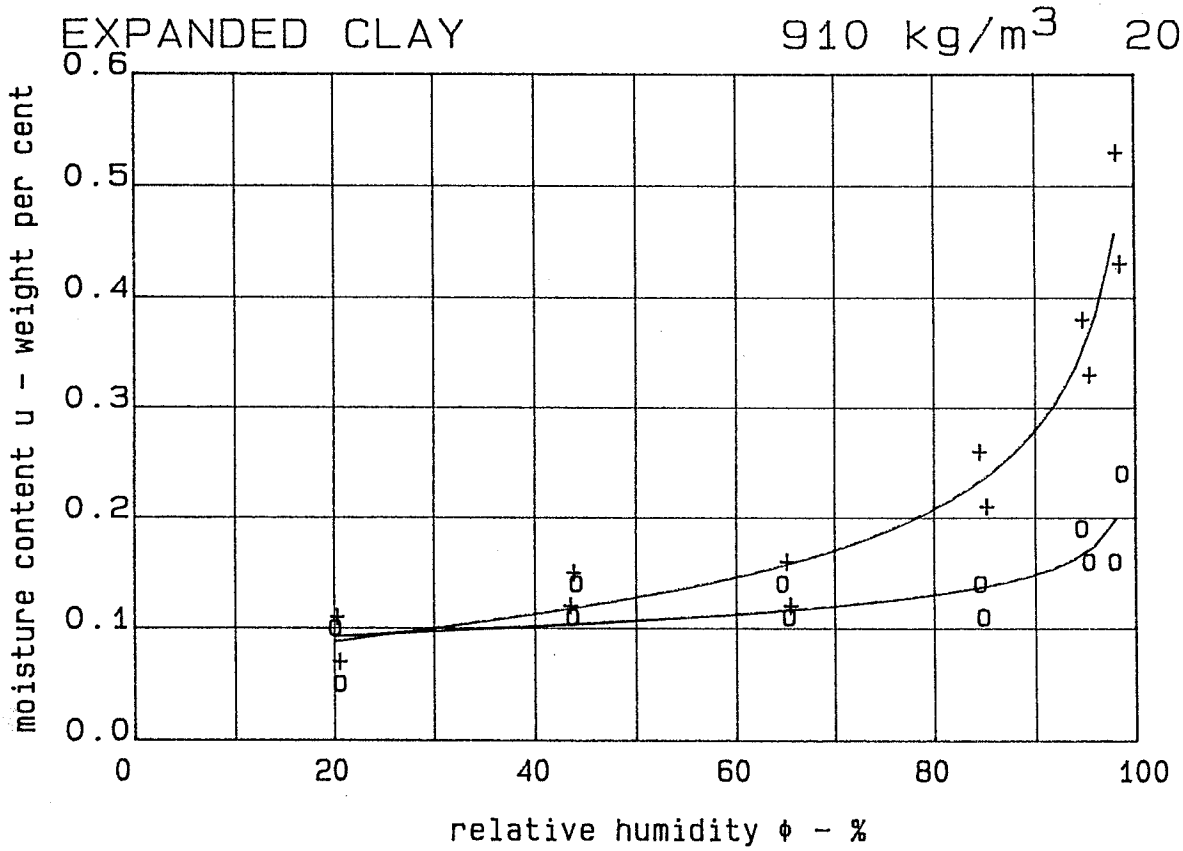
No scanning values

Notes:

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 17-10-85 Initials: KKH File: \M_U\SILICAGE

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	98.1	98.5	94.7	95.4	84.5	85.2	65.2	65.6	43.9	43.5	20.3	20.5
u	0.53	0.43	0.38	0.33	0.26	0.21	0.16	0.12	0.15	0.12	0.11	0.07

Approximation:
u= 6.05E-01*exp((-1/2.20)*ln(1-ln(ϕ)/ 2.35E-02))

o measured adsorption values

ϕ	20.5	20.1	43.7	44.1	65.4	64.7	84.9	84.6	95.3	94.6	97.9	98.7
u	0.05	0.10	0.11	0.14	0.11	0.14	0.11	0.14	0.16	0.19	0.16	0.24

Approximation:
u= 9.09E-01*exp((-1/5.75)*ln(1-ln(ϕ)/ 3.18E-06))

No scanning values

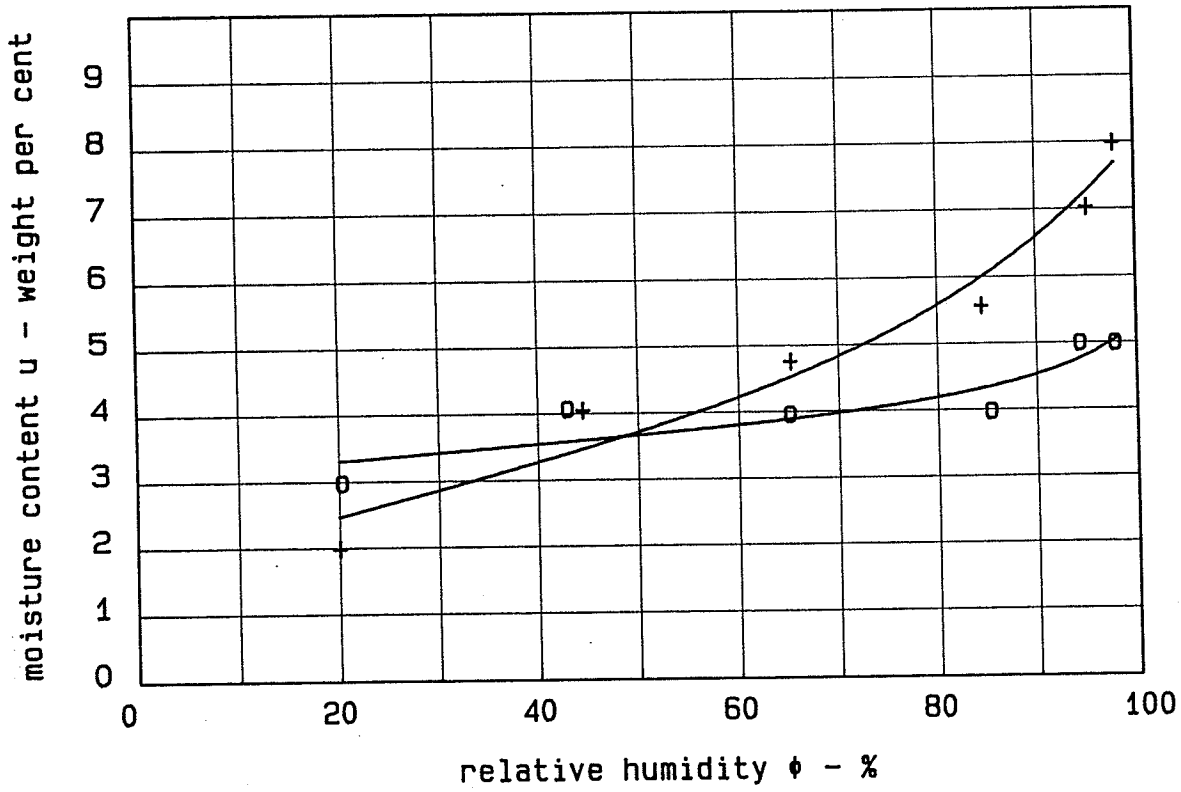
Notes: Open porosity 62%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: expcla20.910

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

EXPANDED POLYSTYREN 31 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 97.9 95.1 84.5 65.1 44.5 20.0
u 7.98 7.02 5.56 4.75 4.04 1.98
Approximation:
u= 8.02E+00*exp((-1/1.62)*ln(1-ln(ϕ)/ 2.80E-01))

o measured adsorption values

ϕ 20.3 42.9 65.0 85.3 94.4 97.9
u 2.97 4.06 3.95 3.97 4.99 4.99
Approximation:
u= 5.32E+00*exp((-1/7.60)*ln(1-ln(ϕ)/ 4.39E-02))

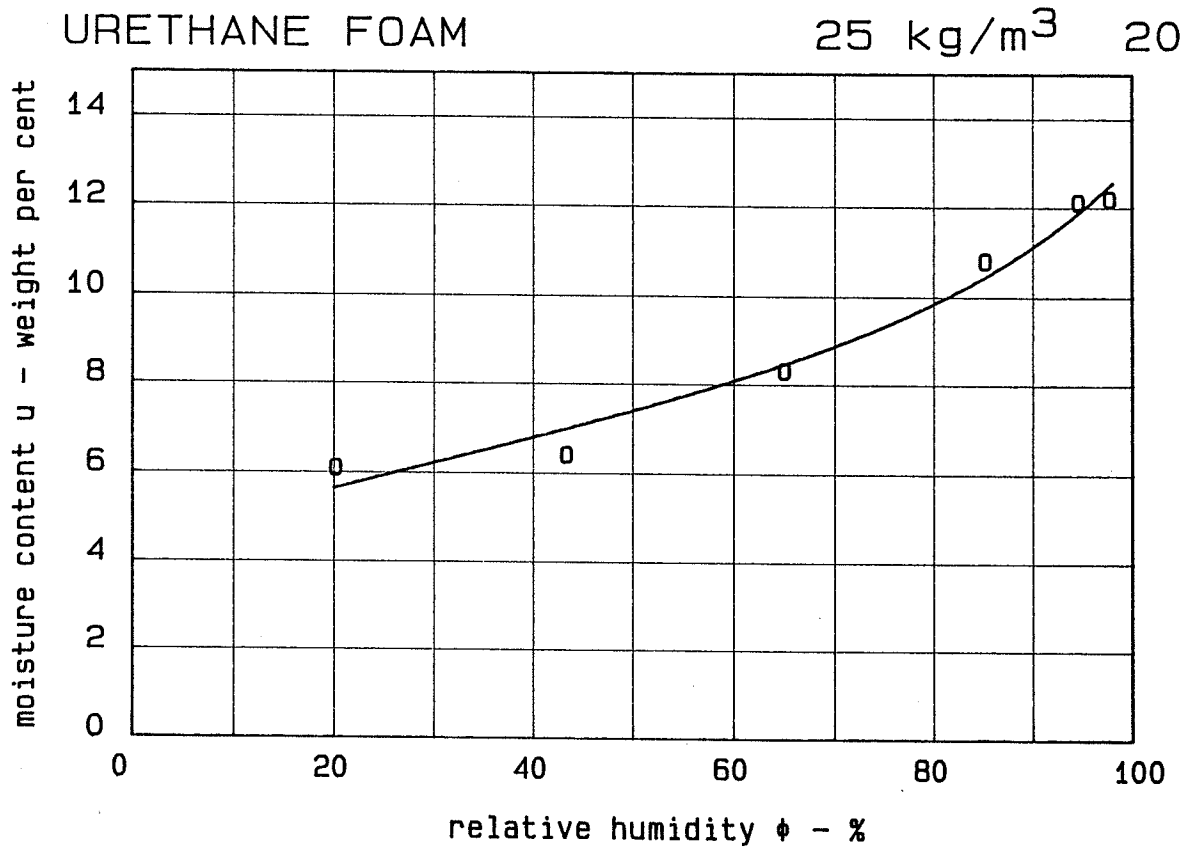
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \D_K\EXPPOL20.031

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	20.2	43.4	65.0	85.2	94.6	97.7
u	6.1	6.4	8.3	10.8	12.1	12.2

Approximation:
u= 1.30E+01*exp((-1/2.56)*ln(1-ln(ϕ)/ 2.15E-01))

No scanning values

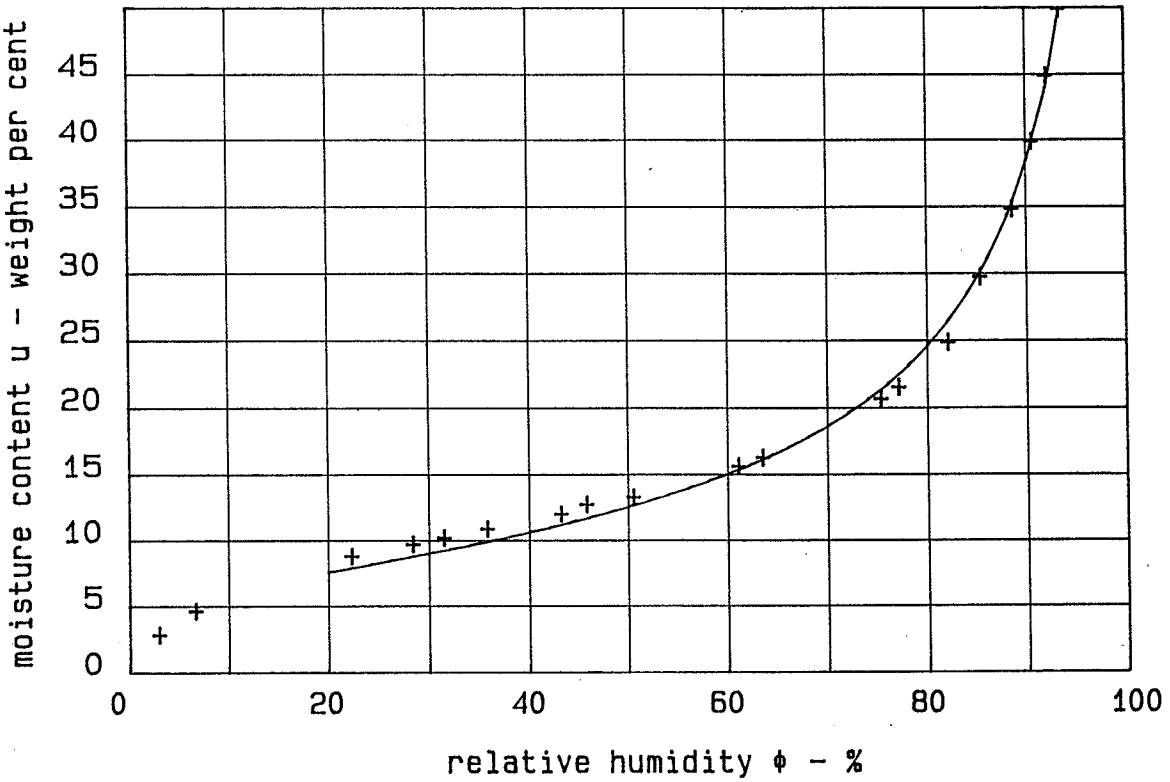
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \M_U\UREFOA20.025

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

POTATOS 0 kg/m^3 20.0°C



\+ measured desorption values

ϕ	93.4	92.0	90.5	88.5	85.3	82.0	77.1	75.3	63.5	61.0	50.5	45.7	43.1	35.7	31.4	2
u	49.9	44.9	39.8	34.8	29.7	24.9	21.5	20.7	16.3	15.6	13.3	12.7	12.0	10.9	10.2	

Approximation:

$u = 3.72E+02 * \exp((-1/1.67) * \ln(1-\ln(\phi) / 2.43E-03))$

No scanning values

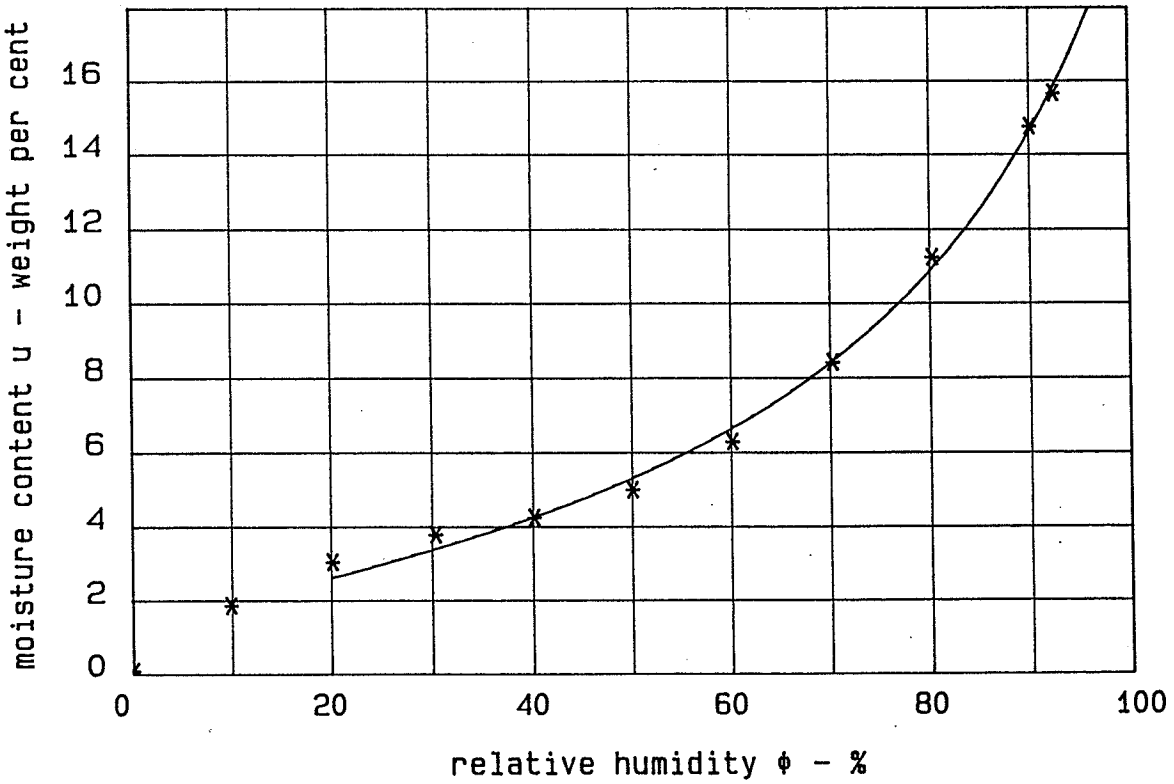
Notes: Density not indicated.
Also measurements at 40C, 60C and 80C.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 17-10-85 Initials: KKH File: \M_U\POTATOS

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

RUSK 0 kg/m^3 0.0 °C



* measured sorption values

ϕ	0.0	10.0	20.1	30.3	40.1	50.0	60.1	70.2	80.2	90.0	92.4
u	0.1	1.9	3.1	3.8	4.3	5.0	6.3	8.4	11.3	14.8	15.7

Approximation:

u= 2.10E+01*exp((-1/0.96)*ln(1-ln(ϕ)/ 2.55E-01))

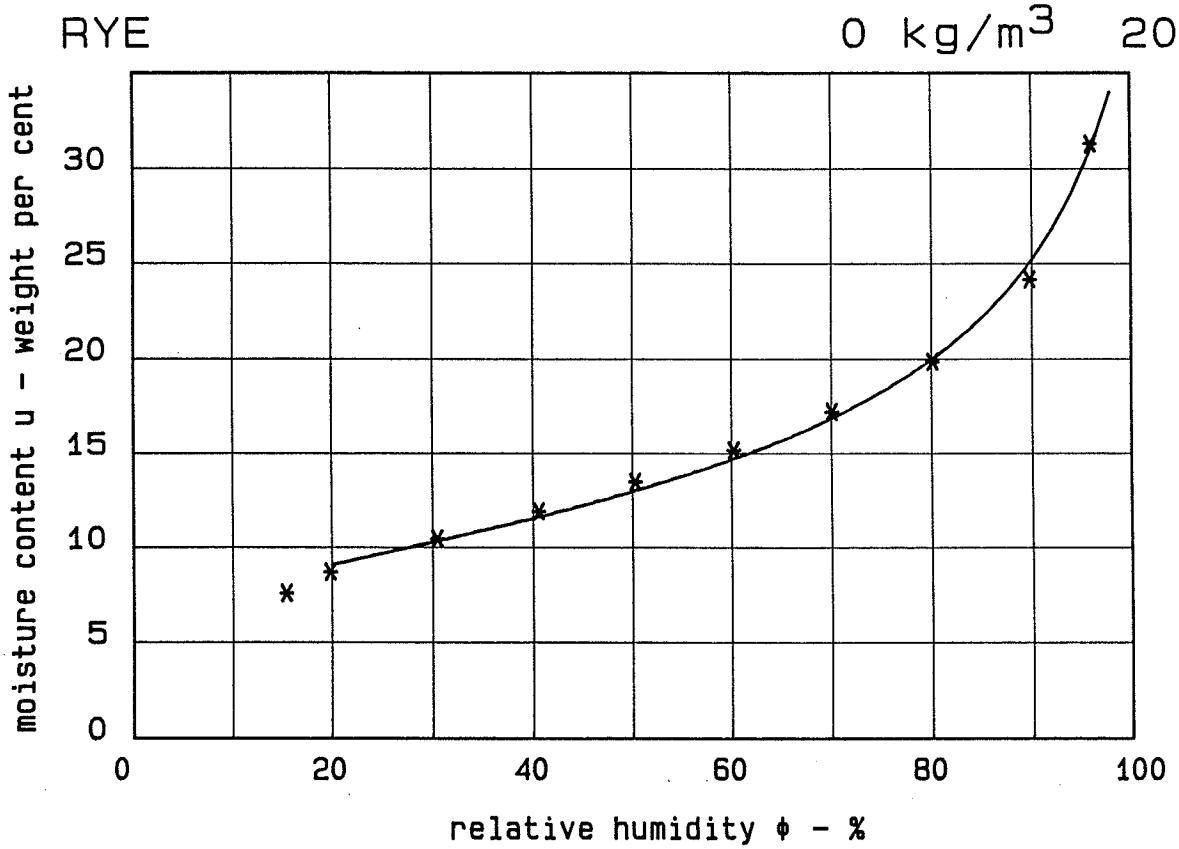
No scanning values

Notes: Density and temperature not indicated.
Danish term: Tvebak.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: \M_U\RUSK

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	15.5	19.9	30.5	40.6	50.3	60.3	70.1	80.1	89.8	96.0
u	7.6	8.7	10.5	11.9	13.5	15.2	17.2	19.9	24.2	31.3

Approximation:

u= 3.81E+01*exp((-1/2.21)*ln(1-ln(ϕ)/ 7.07E-02))

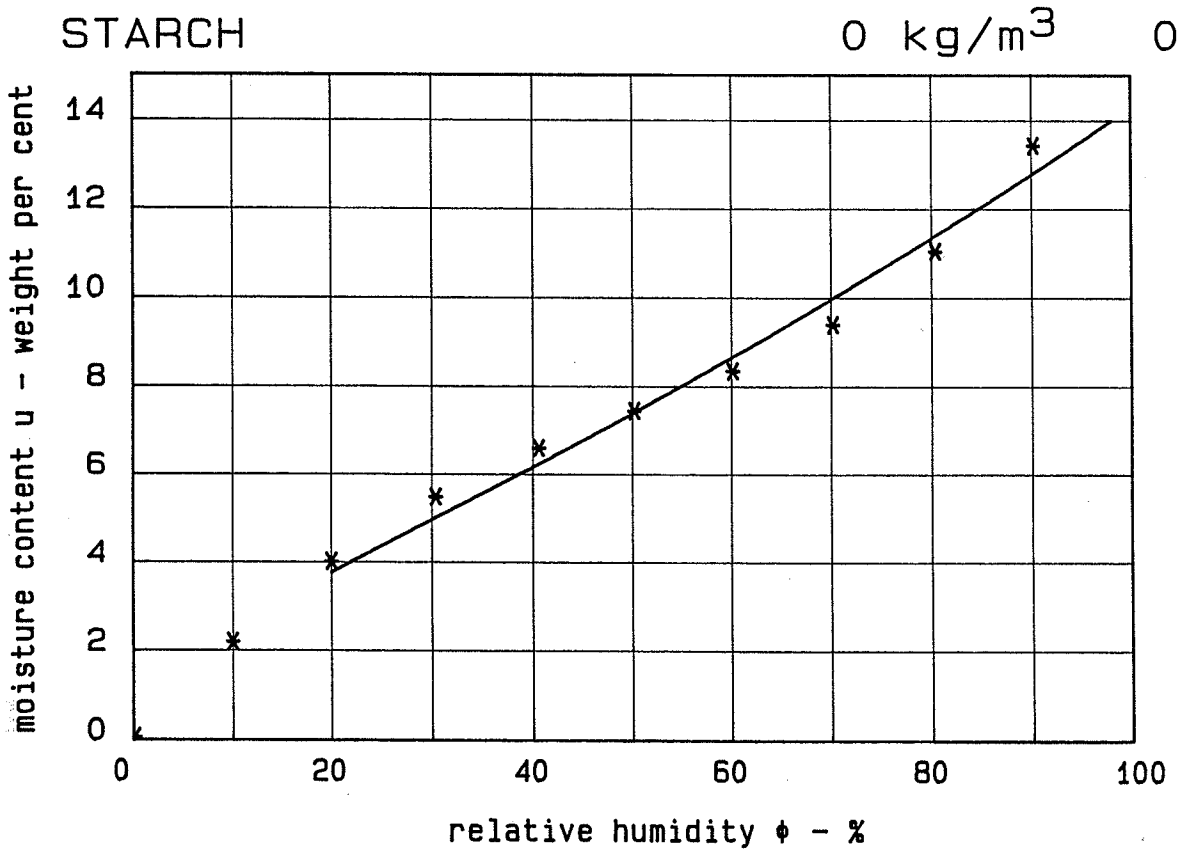
No scanning values

Notes: Density not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: rye20

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.2	10.1	20.0	30.4	40.6	50.2	60.1	70.2	80.4	90.2
u	0.1	2.2	4.0	5.5	6.6	7.4	8.3	9.4	11.0	13.4

Approximation:

u= 1.43E+01*exp((-1/0.39)*ln(1-ln(ϕ)/ 2.38E+00))

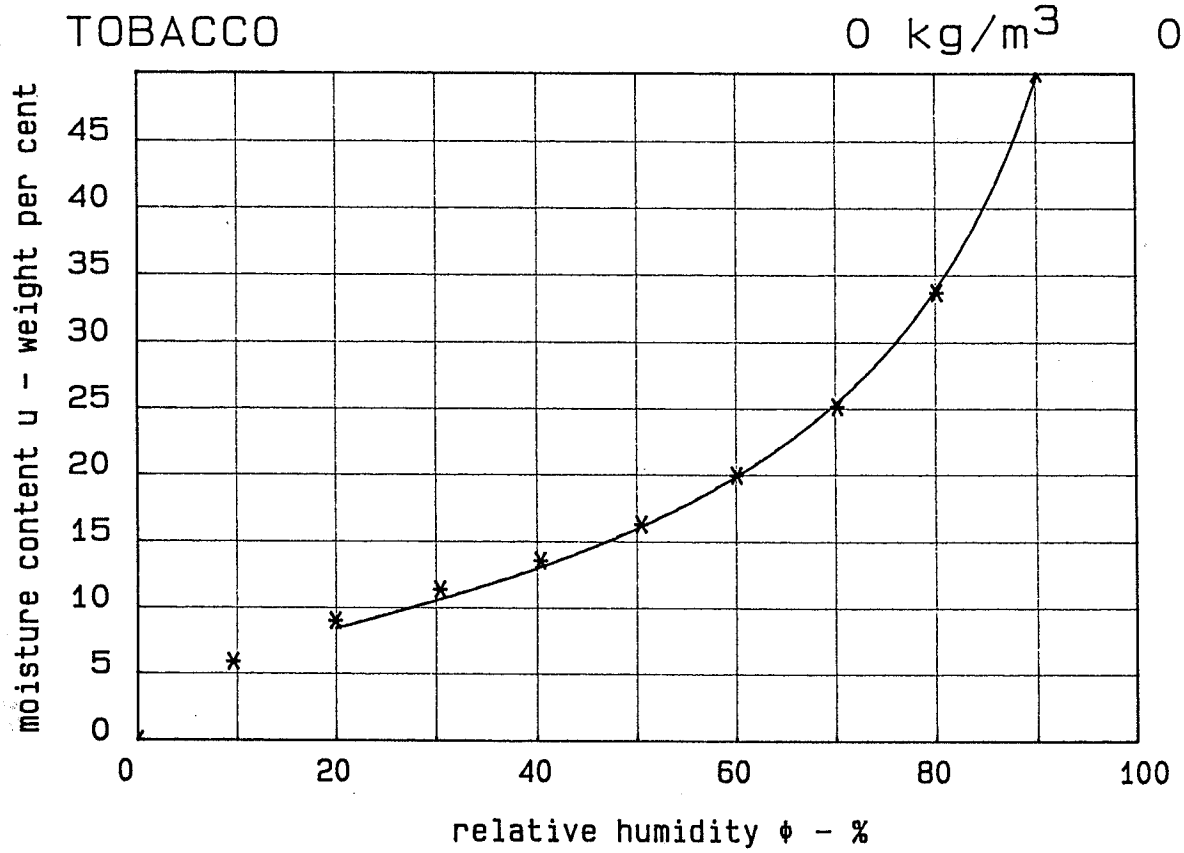
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: starch

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.0	9.7	20.0	30.4	40.3	50.4	60.1	70.2	80.1	90.1
u	0.0	5.9	8.9	11.3	13.5	16.2	19.9	25.1	33.6	50.0

Approximation:

u= 9.11E+01*exp((-1/1.20)*ln(1-ln(ϕ)/ 9.85E-02))

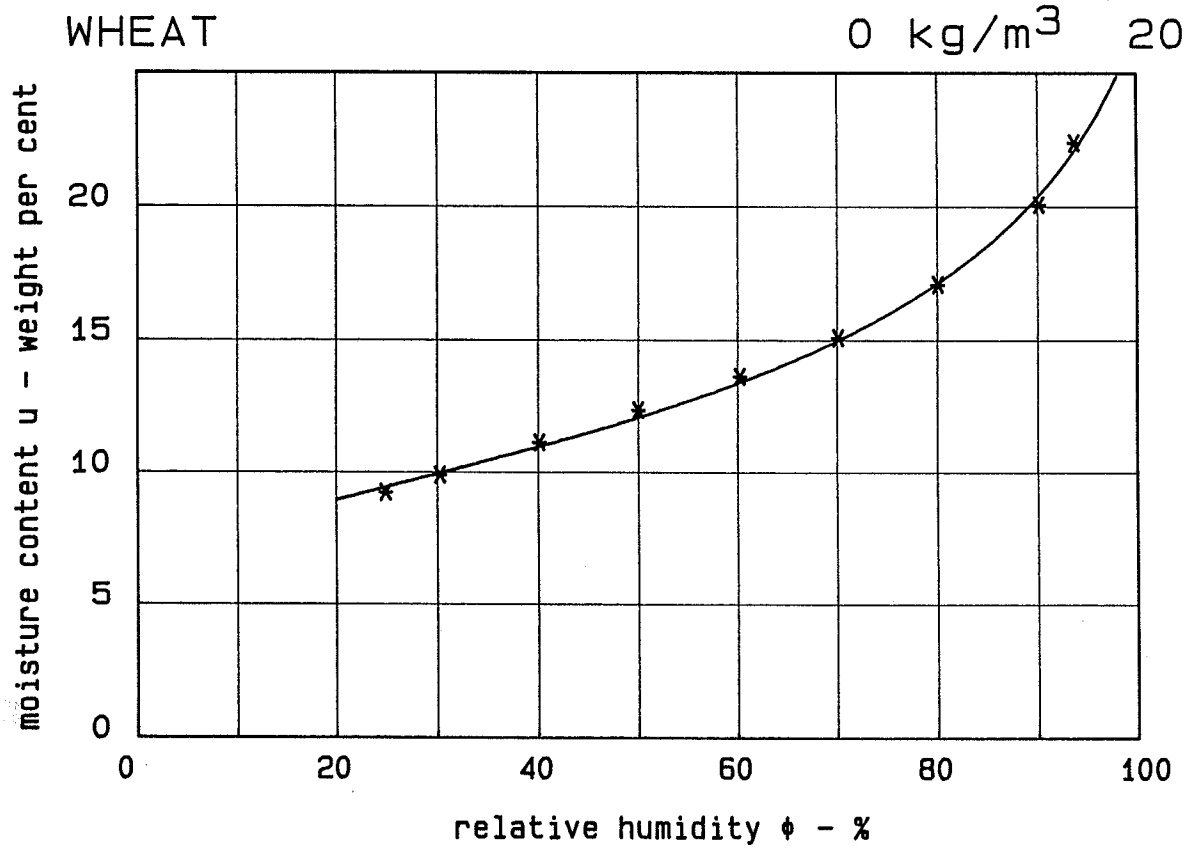
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 14-10-85 Initials: KKH File: \M_U\TOBACCO

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	24.9	30.3	40.1	50.0	60.2	70.1	80.1	90.2	93.7
u	9.2	9.9	11.1	12.4	13.6	15.1	17.1	20.1	22.4

Approximation:

u= 2.66E+01*exp((-1/2.53)*ln(1-ln(ϕ)/ 1.09E-01))

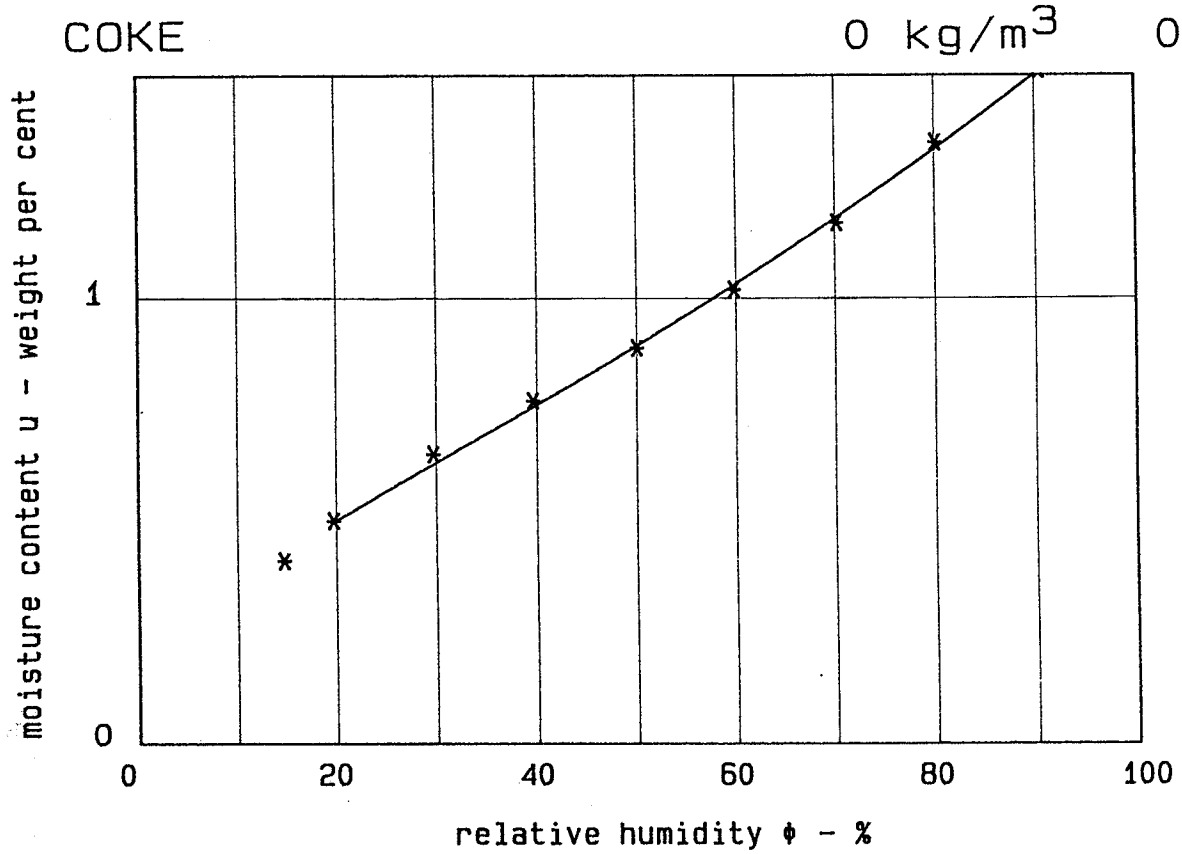
No scanning values

Notes: Density not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: wheat20

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	14.7	19.7	29.7	39.6	50.0	59.8	70.2	80.1	90.5
u	0.41	0.50	0.65	0.77	0.89	1.02	1.17	1.35	1.51

Approximation:

$u = 1.68E+00 * \exp((-1/0.59) * \ln(1-\ln(\phi)/1.53E+00))$

No scanning values

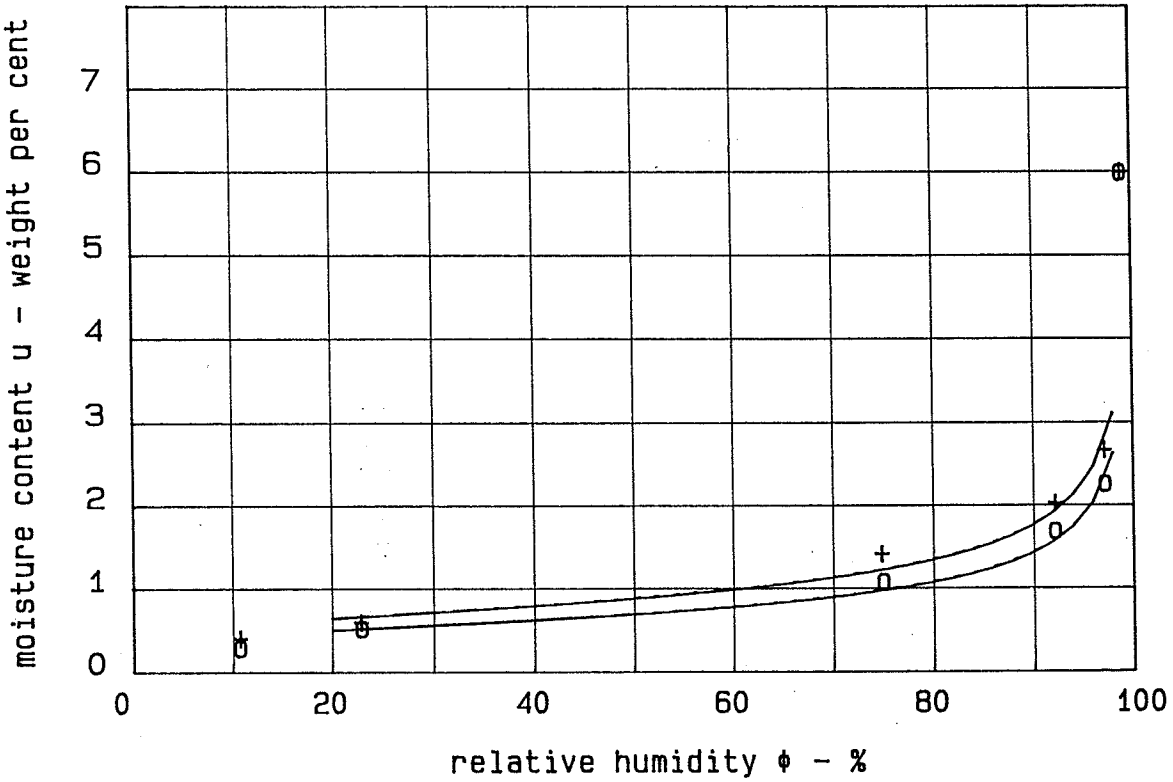
Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: coke

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

DILUVIALSAND fine 0 kg/m^3 23.0°C



\+ measured desorption values

ϕ 99.0 97.1 92.1 74.8 22.8 10.7
u 6.00 2.67 2.03 1.42 0.60 0.41
Approximation:
u= 6.00E+00*exp((-1/2.69)*ln(1-ln(ϕ)/ 4.17E-03))

o measured adsorption values

ϕ 10.7 22.9 75.0 92.1 97.2 99.0
u 0.29 0.52 1.08 1.69 2.26 5.99
Approximation:
u= 6.27E+00*exp((-1/2.60)*ln(1-ln(ϕ)/ 2.37E-03))

No scanning values

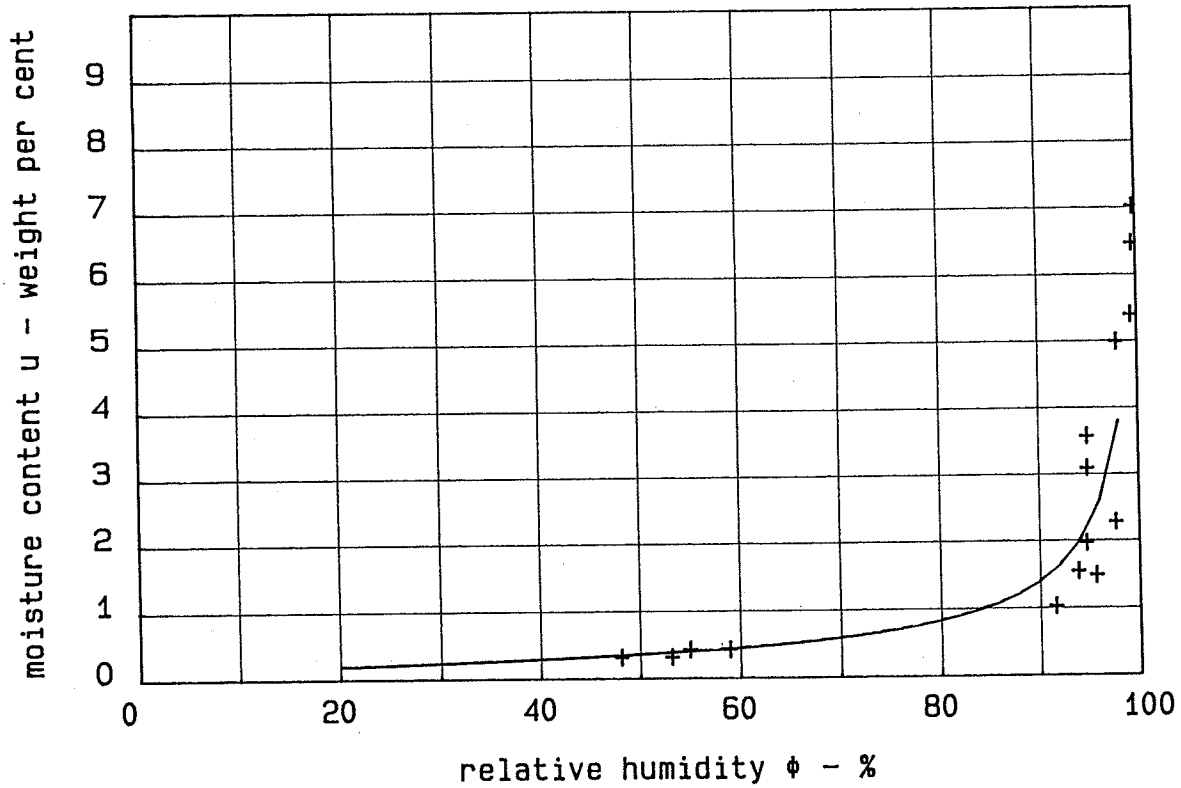
Notes: Boring 100 on the campus of Technical University of Denmark in Lyngby made by Danish Geotechnical Institute.

Litterature: Hansen, Kurt Kielsgaard: Luftsolfangere og varmelagring i jord. Medd. 118. Thermal Ins. Lab., Technical University of Denmark.1982.

Date: 24- 3-86 Initials: KKH File: \D_K\DILUSAND

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

GRAVEL 0 - 8 mm Nymoelle 0 kg/m^3 0.0°C



\+ measured desorption values

ϕ	99.7	99.6	99.4	97.9	94.8	94.8	97.7	94.7	95.7	93.8	91.5	58.9	54.9	53.1	48.0
u	7.01	6.46	5.39	4.98	3.56	3.08	2.27	1.96	1.48	1.54	1.02	0.42	0.42	0.31	0.31

Approximation:

u= 8.07E+00*exp((-1/1.31)*ln(1-ln(ϕ)/ 1.19E-02))

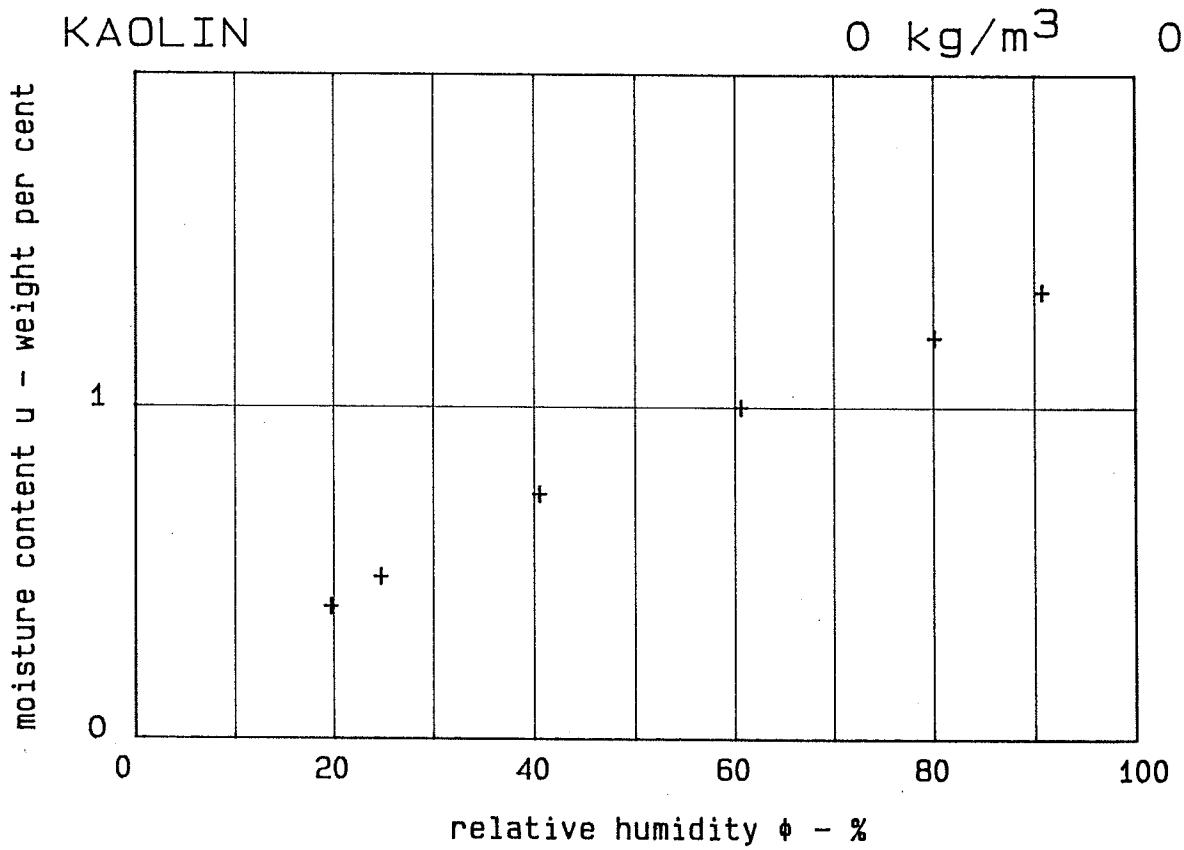
No scanning values

Notes: Density and temperature not indicated.

Litterature: Nielsen, Anders: Sorption properties of concrete with alkali-silica reactive aggregate. Technological Institute, Denmark. 1984.

Date: 24- 3-86 Initials: KKH File: \D_K\GRAVEL

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	90.7	80.0	60.5	40.4	24.7	19.7
u	1.35	1.21	1.00	0.74	0.49	0.40

Approximation:

u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

No scanning values

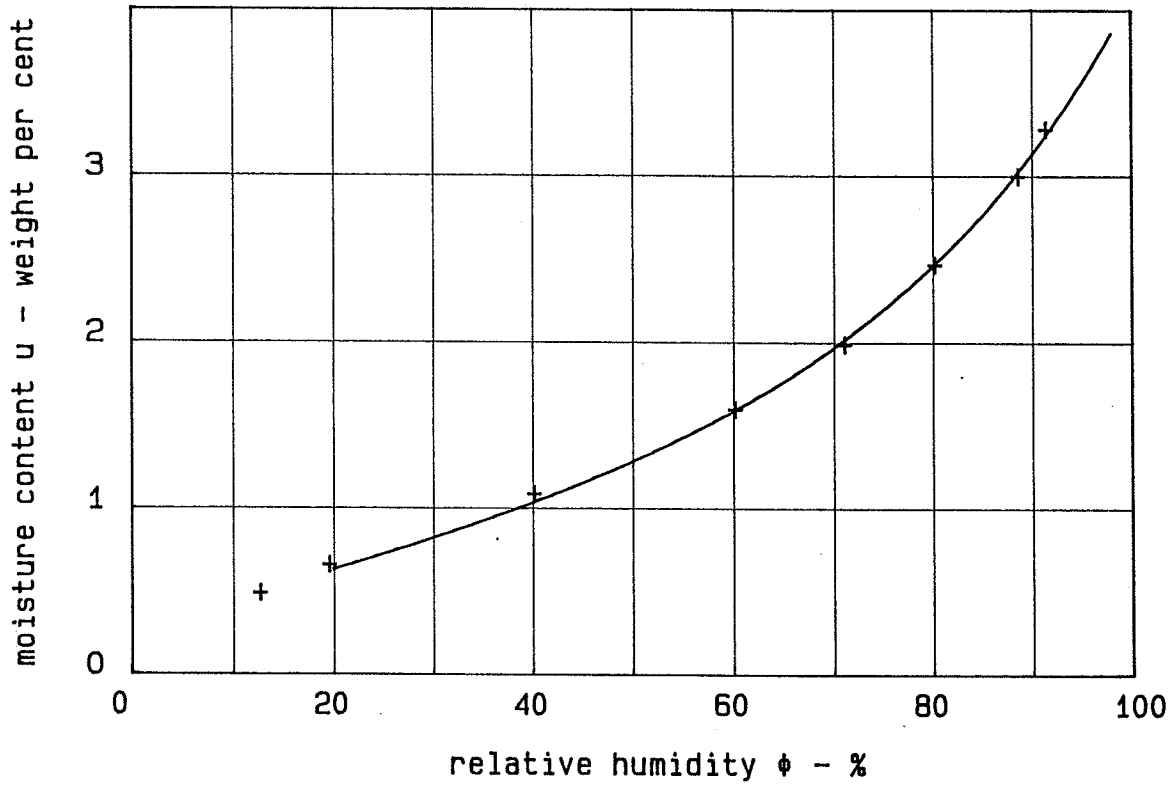
Notes: Density and temperature not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \D_K\KAOLINK

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

KIESELGUHR 0 kg/m^3 0.0°C



\+ measured desorption values

ϕ	91.4	88.6	80.2	71.1	60.2	40.1	19.5	12.7	0.0
u	3.28	3.00	2.47	1.99	1.60	1.09	0.66	0.49	0.00

Approximation:

u= 4.08E+00*exp((-1/0.85)*ln(1-ln(ϕ)/ 4.21E-01))

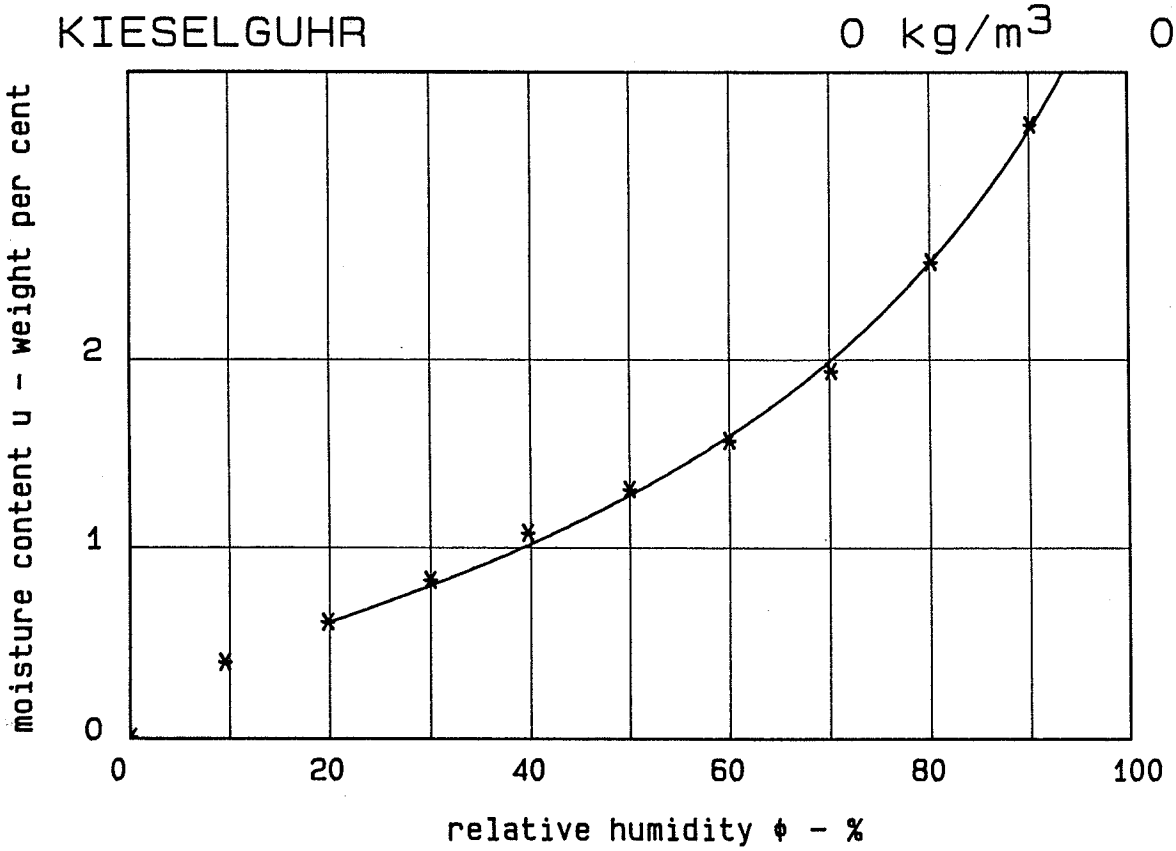
No scanning values

Notes: Density and temperature not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \D_K\KIESELGK

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.1	9.6	19.8	30.0	39.7	50.0	60.0	70.2	80.2	90.1
u	0.01	0.40	0.61	0.83	1.08	1.31	1.57	1.94	2.51	3.23

Approximation:

u= 4.18E+00*exp((-1/0.80)*ln(1-ln(ϕ)/ 4.44E-01))

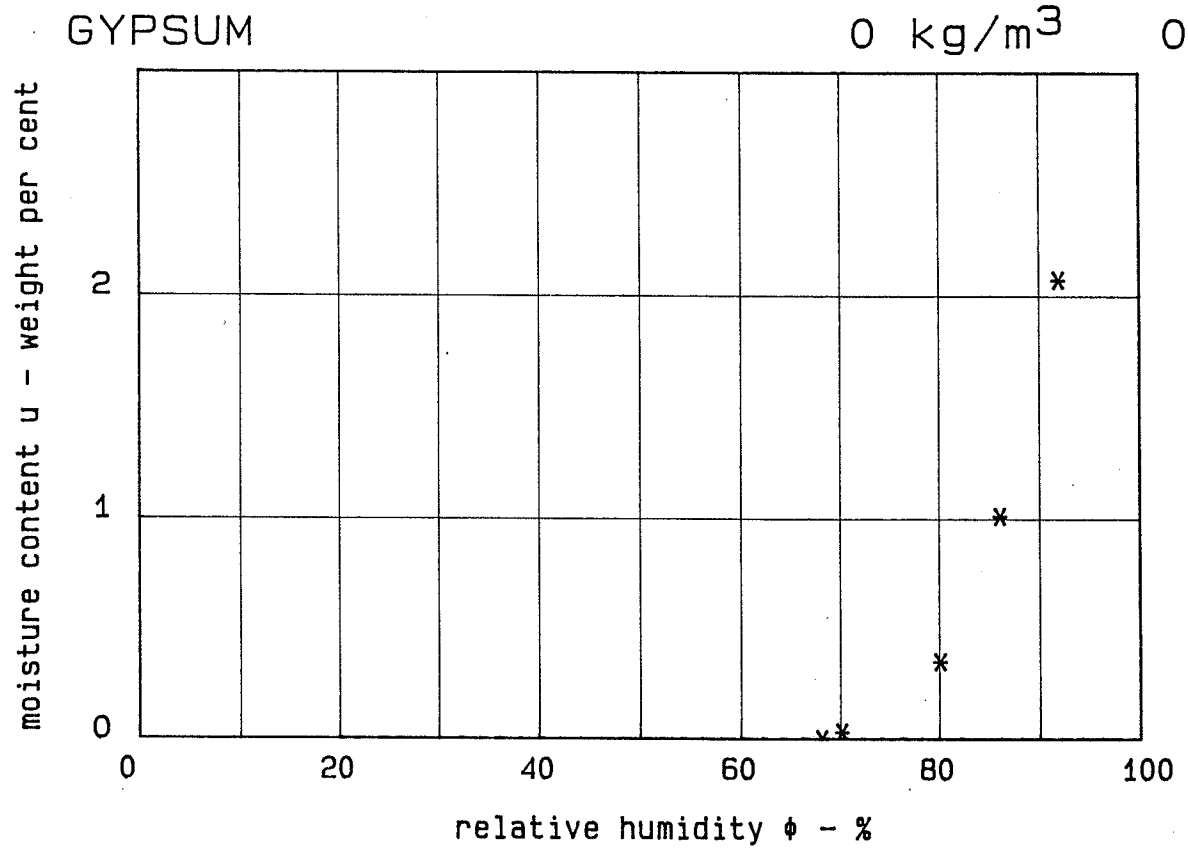
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: kieselgu

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ 68.1 70.1 80.1 86.1 92.0
u 0.00 0.03 0.35 1.01 2.07
Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

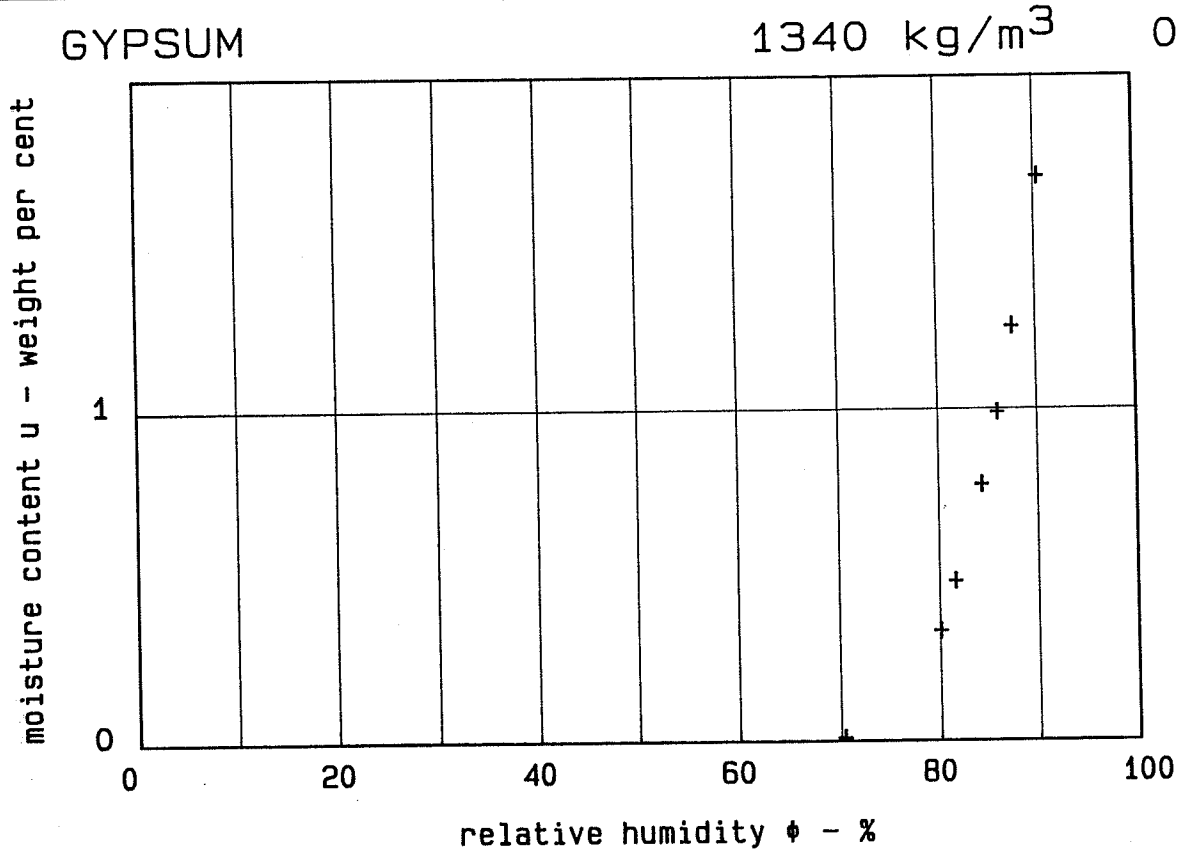
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: \D_K\GYPSUM

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	90.3	87.6	86.0	84.3	81.6	80.0	70.3
u	1.70	1.25	0.99	0.77	0.48	0.33	0.01

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

No scanning values

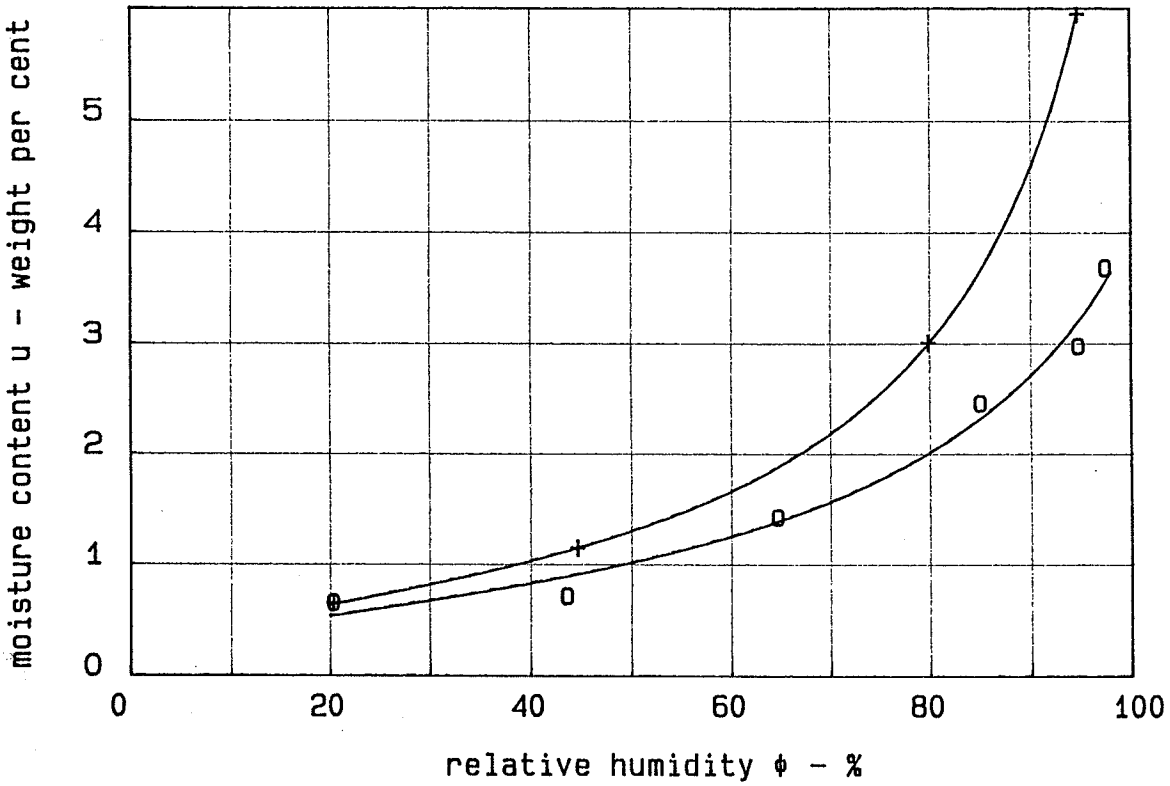
Notes: Temperature not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnih. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \D_K\GYPSUMK.134

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

PLASTER OF PARIS 1240 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 94.7 79.8 44.6 20.3
u 5.95 3.00 1.14 0.65
Approximation:
u= 8.81E+00*exp((-1/1.06)*ln(1-ln(ϕ)/ 1.05E-01))

o measured adsorption values

ϕ 20.3 43.6 64.7 85.0 94.7 97.4
u 0.65 0.71 1.42 2.45 2.97 3.68
Approximation:
u= 3.97E+00*exp((-1/1.09)*ln(1-ln(ϕ)/ 2.03E-01))

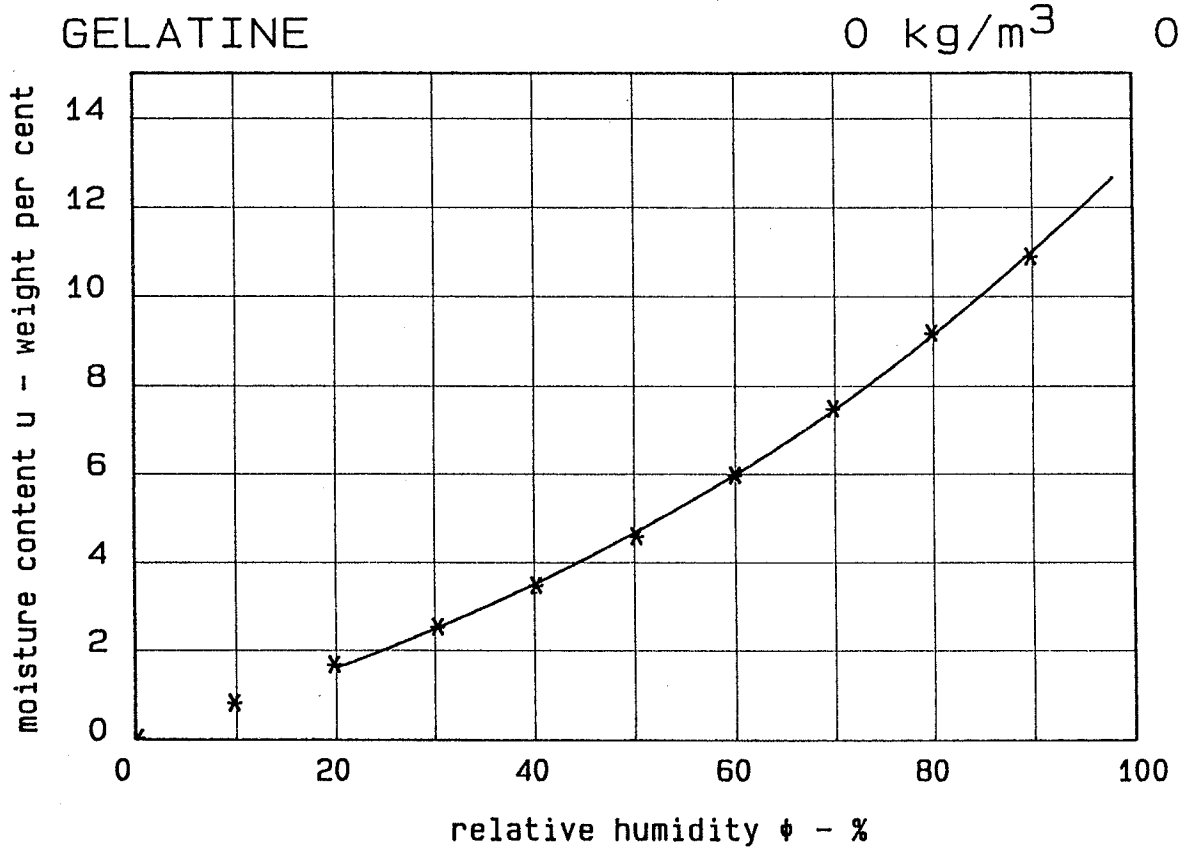
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: \M_U\PLASTE20.124

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.2	9.9	19.8	30.3	40.2	50.3	60.0	69.9	79.9	89.8
u	0.0	0.8	1.7	2.5	3.5	4.6	6.0	7.5	9.2	10.9

Approximation:

u= 1.31E+01*exp((-1/0.23)*ln(1-ln(ϕ)/ 2.54E+00))

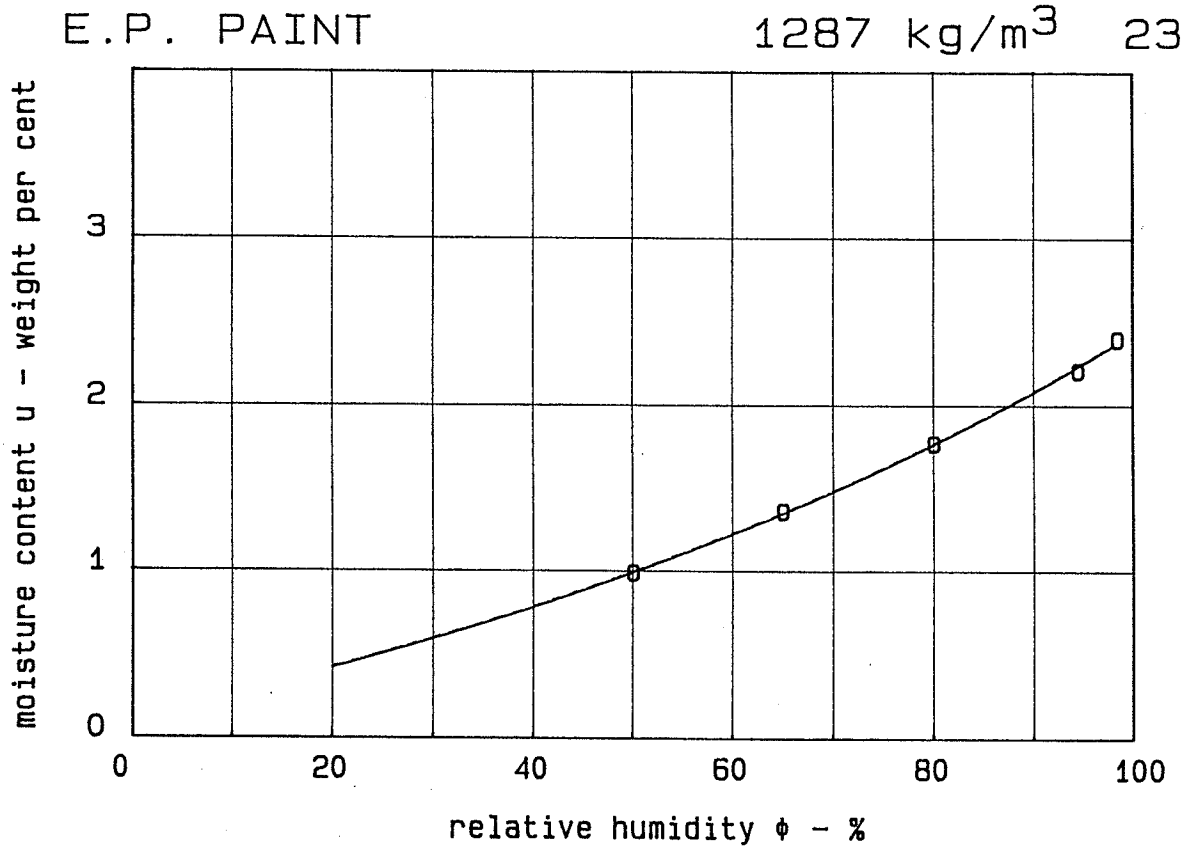
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 14-10-85 Initials: KKH File: gelatine

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	50.0	65.0	80.0	94.5	98.5
u	0.99	1.36	1.77	2.21	2.40

Approximation:
u= 2.44E+00*exp((-1/0.36)*ln(1-ln(ϕ)/ 1.84E+00))

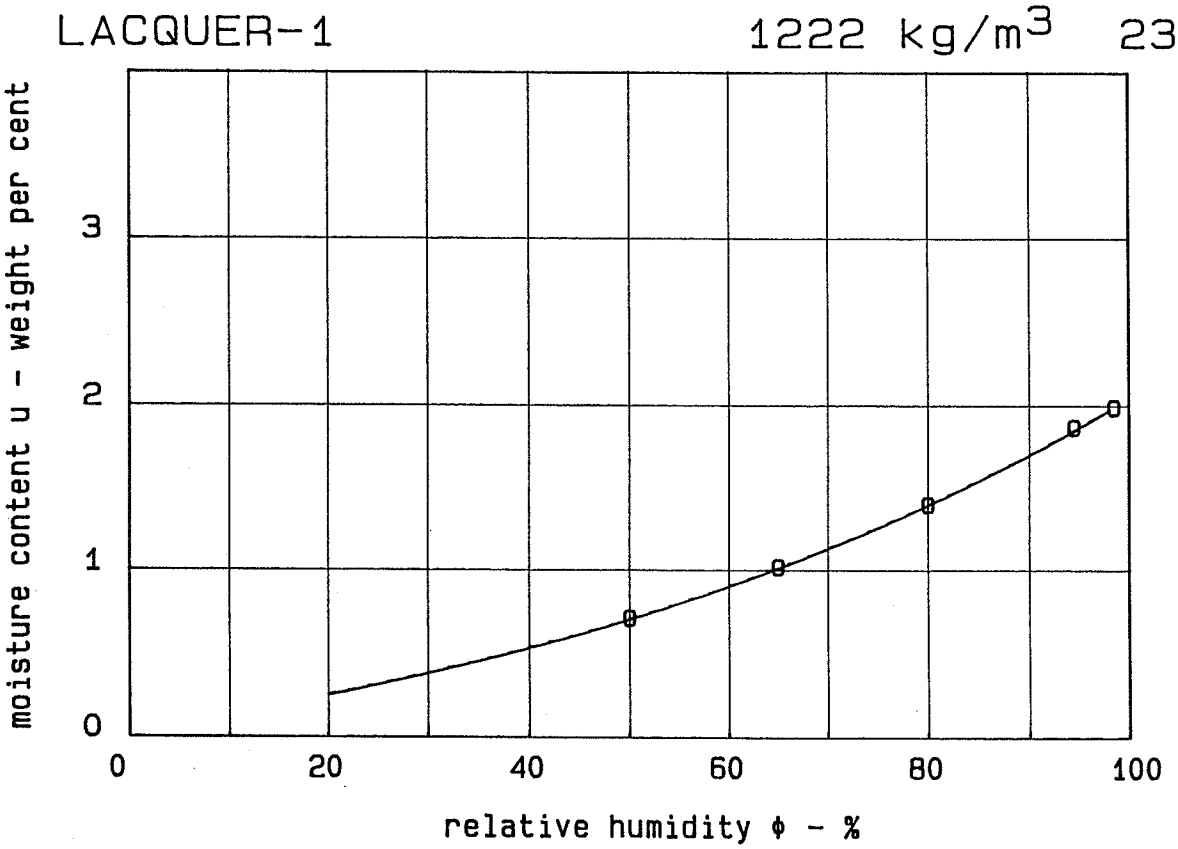
No scanning values

Notes: Coating electrodeposited paint.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: \D_K\EPPAINT

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	50.0	65.0	80.0	94.5	98.5
u	0.71	1.02	1.40	1.87	1.99

Approximation:

u= 2.05E+00*exp((-1/0.29)*ln(1-ln(ϕ)/ 1.92E+00))

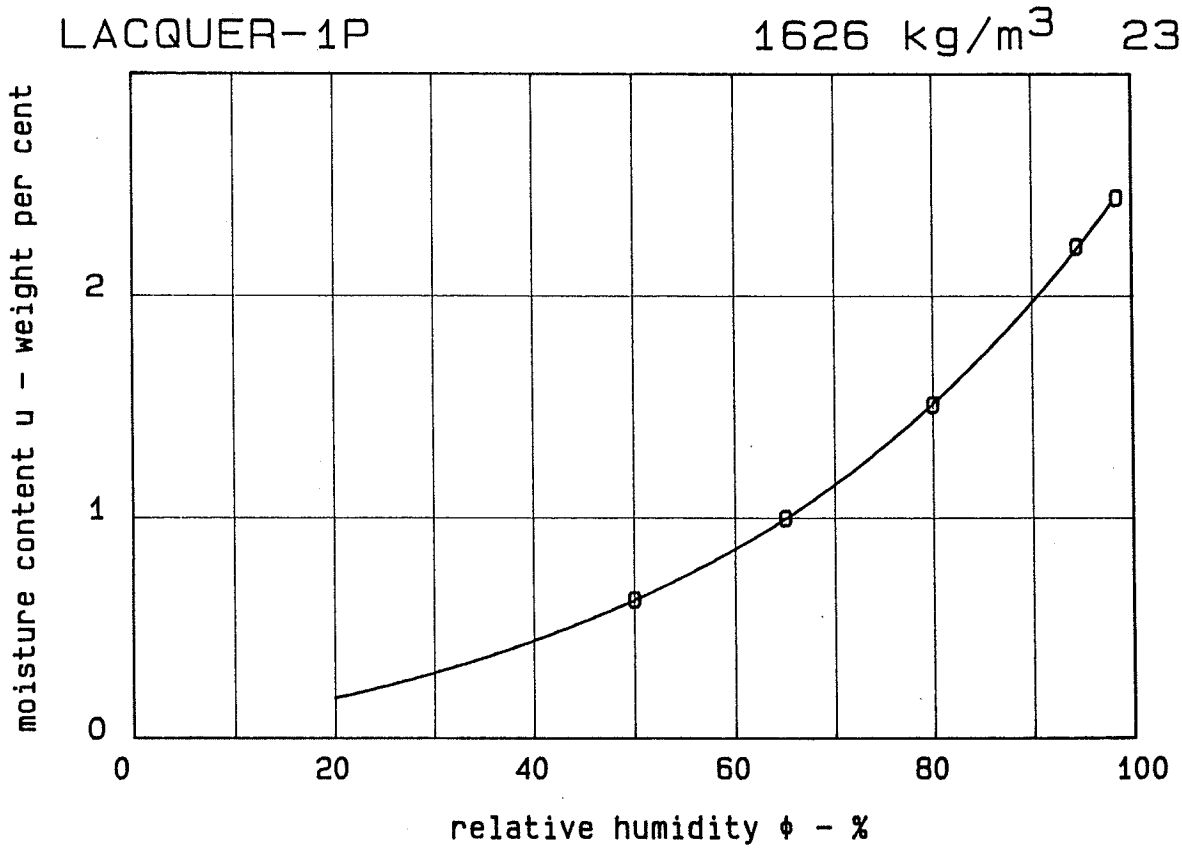
No scanning values

Notes: Clear coating of lacquer 1. Solids: Alkydal R35W, Resydrol WM501.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: \L\LACQUE1

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	50.0	65.0	80.0	94.5	98.5
u	0.63	1.00	1.51	2.22	2.44

Approximation:

u= 2.54E+00*exp((-1/0.30)*ln(1-ln(ϕ)/ 1.32E+00))

No scanning values

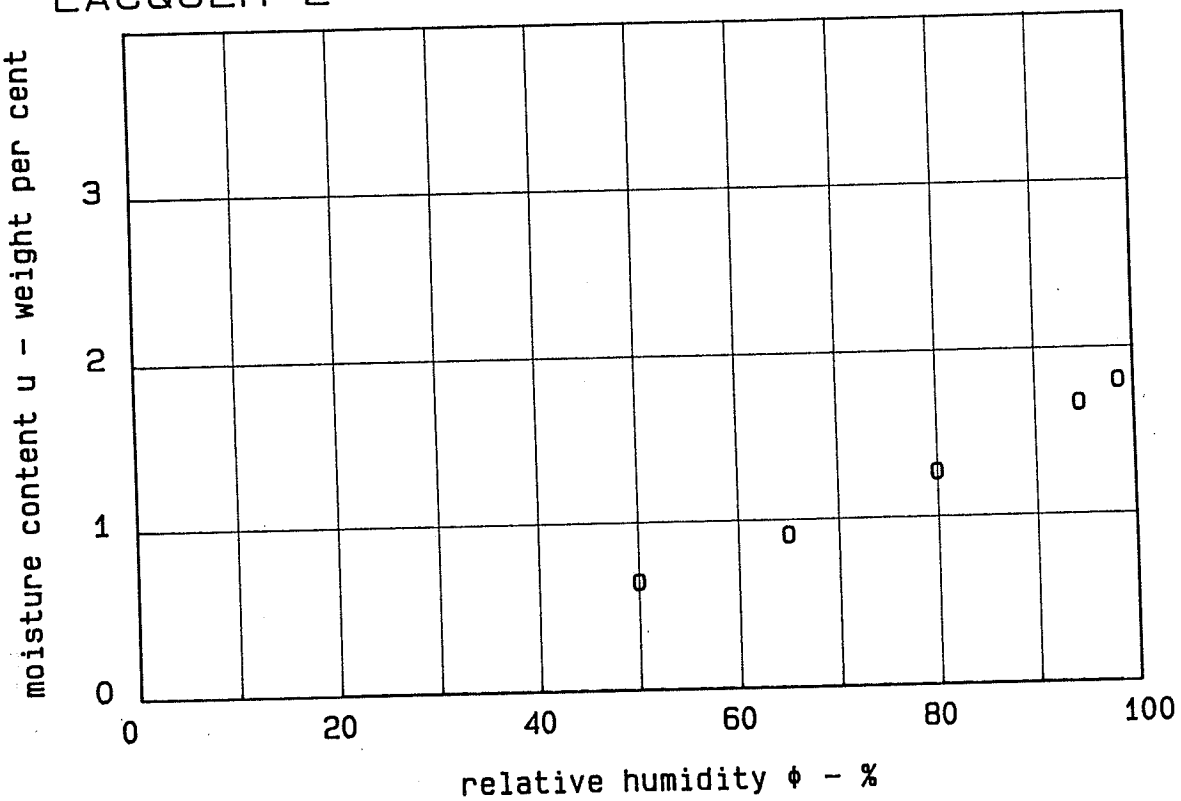
Notes: Pigmented coating of lacquer 1. Solids: Alkydal R35W, Resydrol WM501.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: L\LACQUE1P.

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LACQUER-2 1152 kg/m^3 23.0 °C



o measured adsorption values

φ	50.0	65.0	80.0	94.5	98.5
u	0.64	0.91	1.27	1.67	1.80

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(φ)/ 1.00E+00))

No scanning values

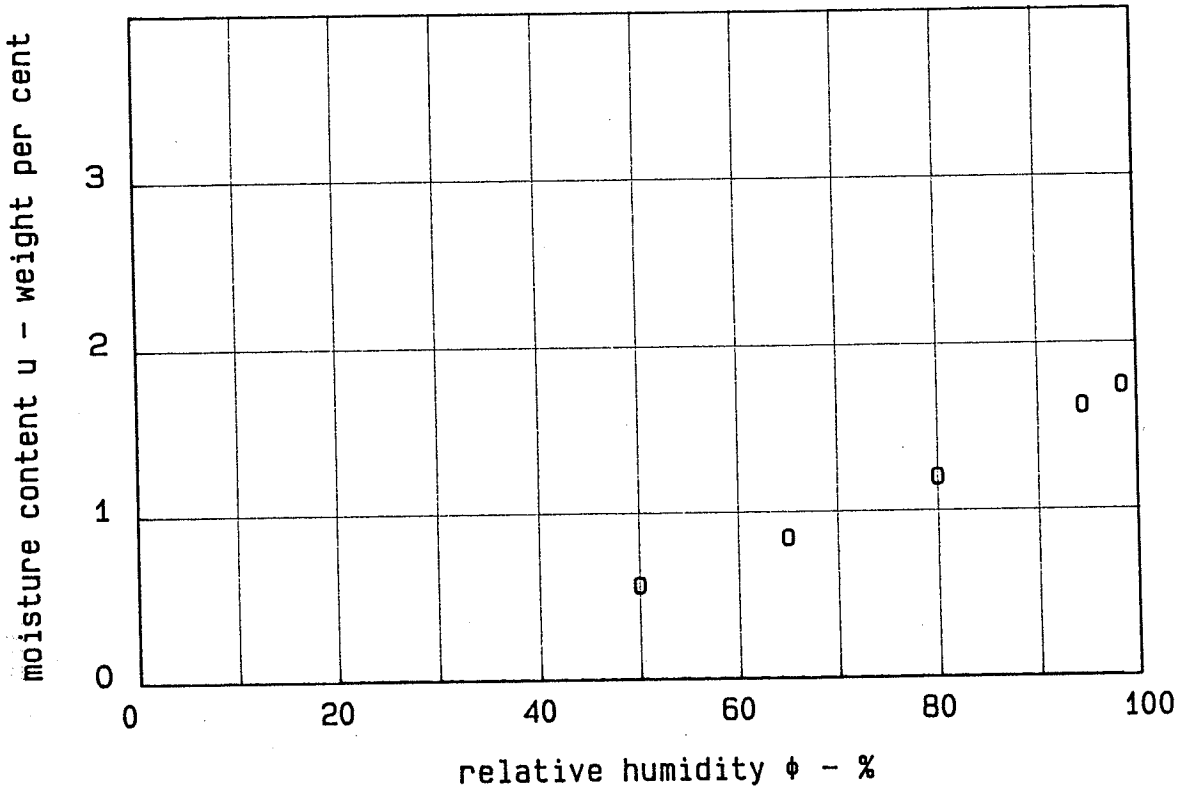
Notes: Clear coating of lacquer 2. Solids: Maprenal WL, Resydrol VWY23.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: \L\LACQUE2

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LACQUER-2P 1532 kg/m^3 23.0 °C



o measured adsorption values

ϕ 50.0 65.0 80.0 94.5 98.5
u 0.56 0.84 1.20 1.62 1.74

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

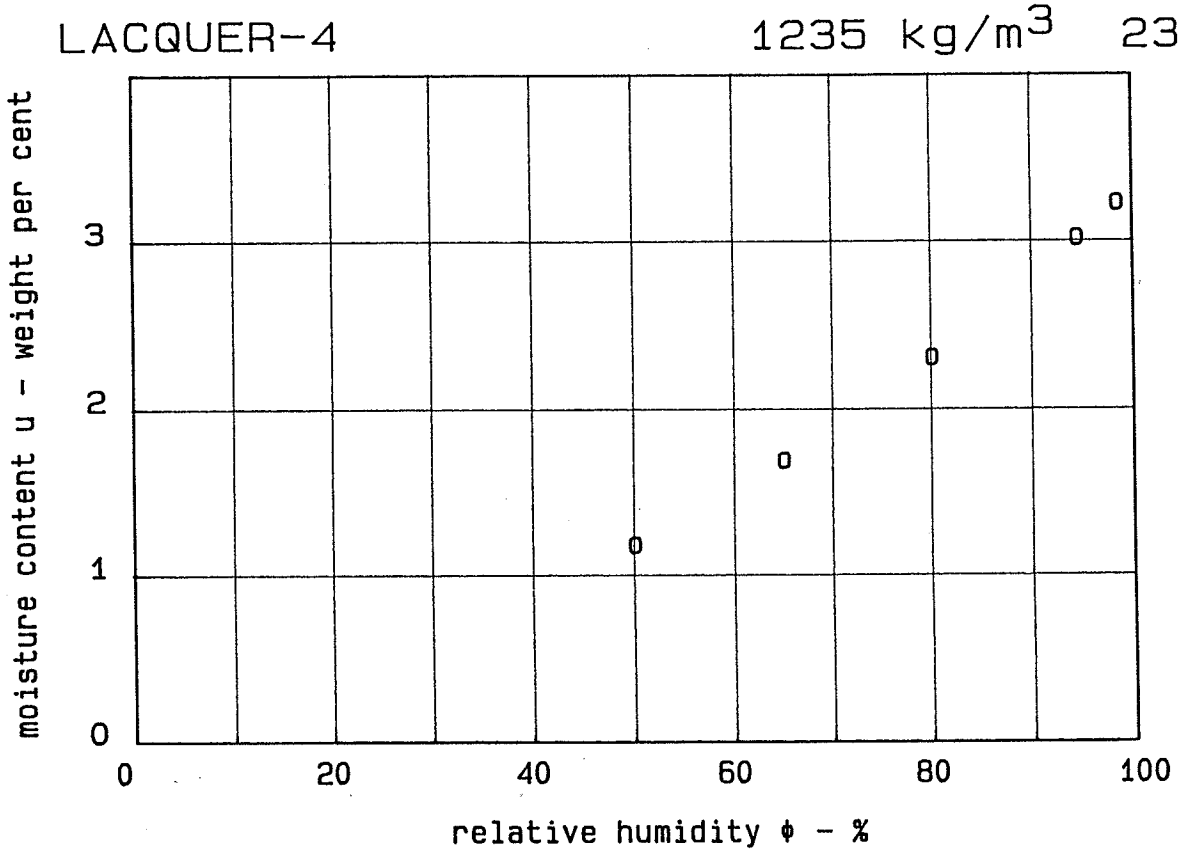
No scanning values

Notes: Pigmented coating of lacquer 2. Solids: Maprenal WL, Resydrol VWY23.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: \L\LACQUE2P

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	50.0	65.0	80.0	94.5	98.5
u	1.18	1.69	2.31	3.02	3.23

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

No scanning values

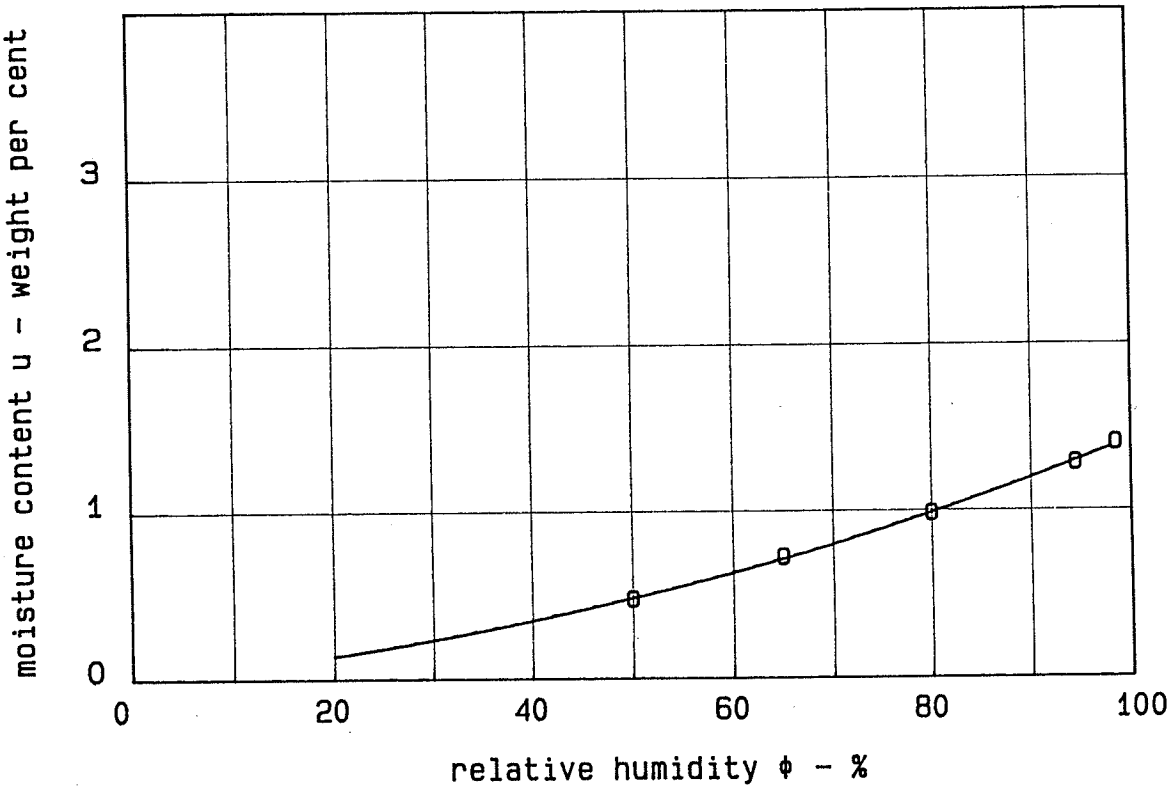
Notes: Lacquer 4. Solids: Alkynol 1363W, Resydrol WM501.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: \L\LACQUE4

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

NC-LACQUER 1226 kg/m^3 23.0 °C



o measured adsorption values

ϕ	50.0	65.0	80.0	94.5	98.5
u	0.47	0.72	0.98	1.28	1.40

Approximation:

u= 1.42E+00*exp((-1/0.12)*ln(1-ln(ϕ)/ 5.09E+00))

No scanning values

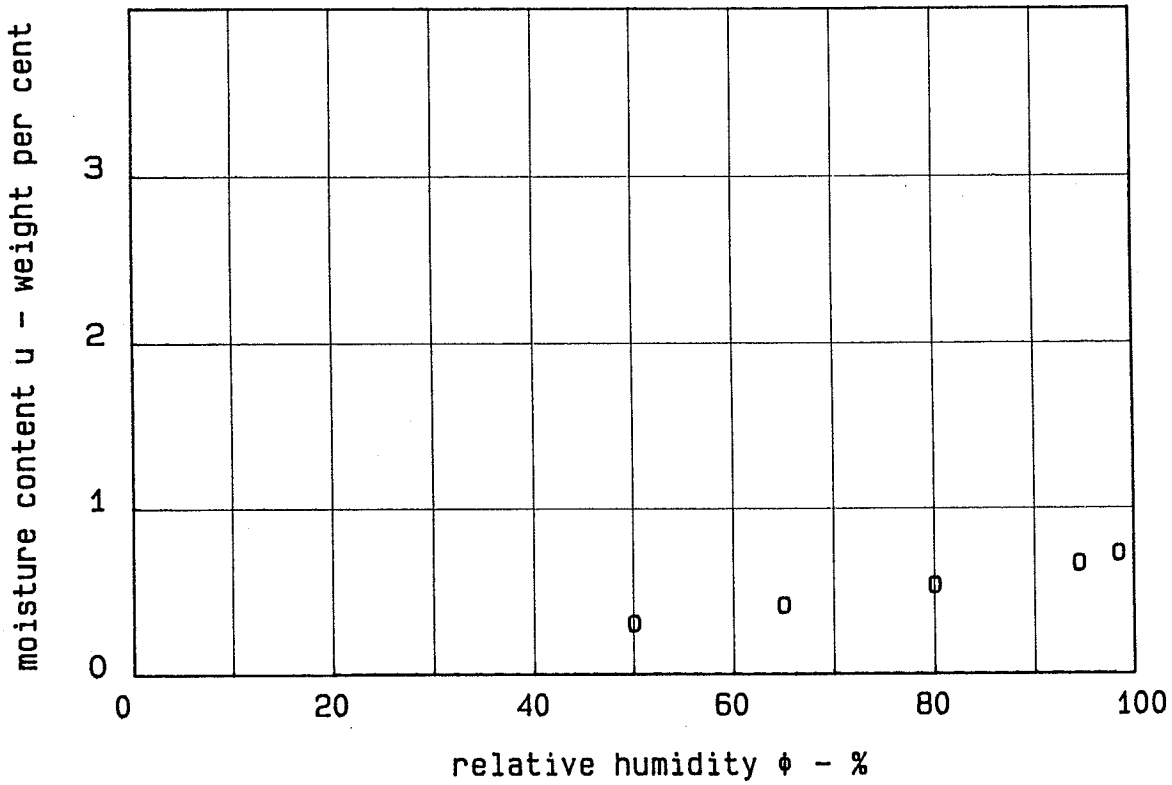
Notes: Clear coating of NC-lacquer. Solids: NC E510 dried, Castor oil, Dioctylphthalate.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: \L\LACQUENC

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

NC-LACQUERP 1628 kg/m^3 23.0 °C



o measured adsorption values

ϕ	50.0	65.0	80.0	94.5	98.5
u	0.30	0.41	0.53	0.66	0.72

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

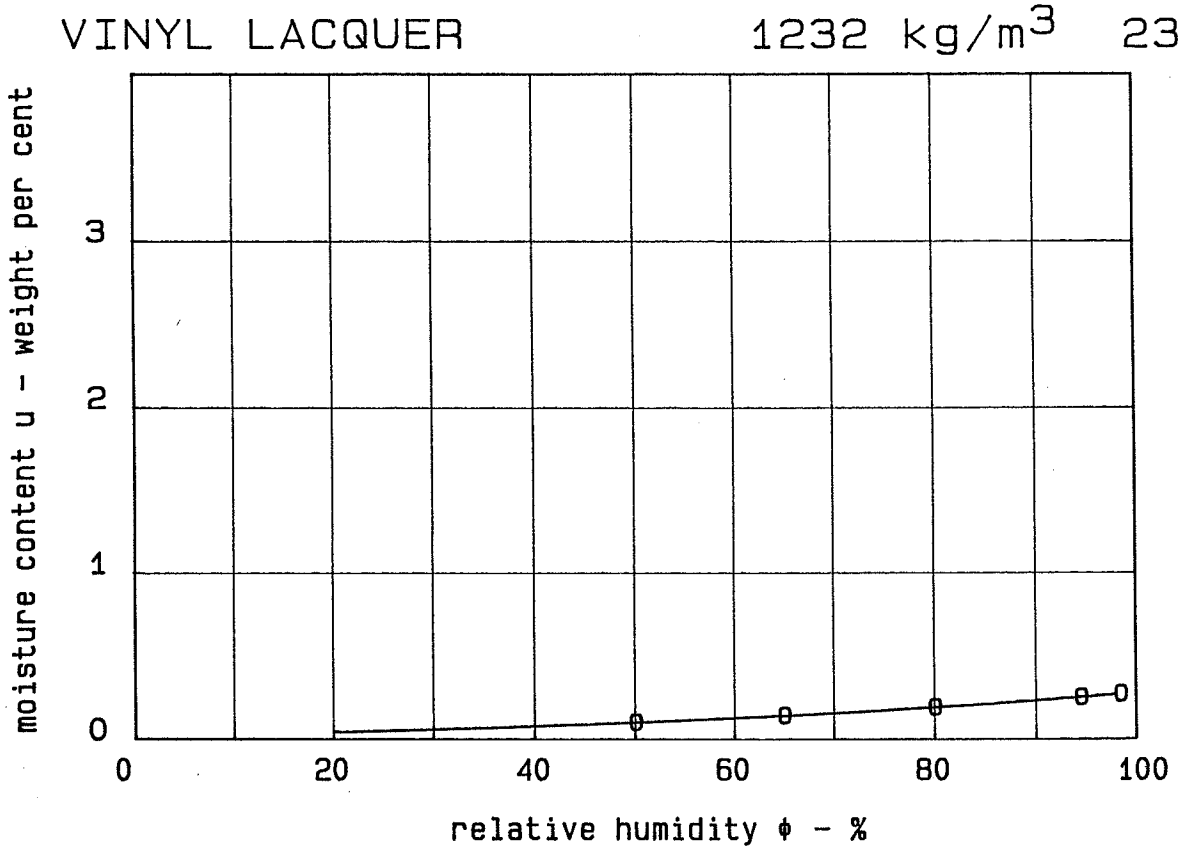
No scanning values

Notes: Pigmented coating of NC-lacquer. Solids: NC 510, Castor oil, Dioctylphthalate.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: \L\LACQUNCP

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	50.0	65.0	80.0	94.5	98.5
u	0.10	0.14	0.19	0.25	0.27

Approximation:
u= 2.77E-01*exp((-1/0.43)*ln(1-ln(ϕ)/ 1.24E+00))

No scanning values

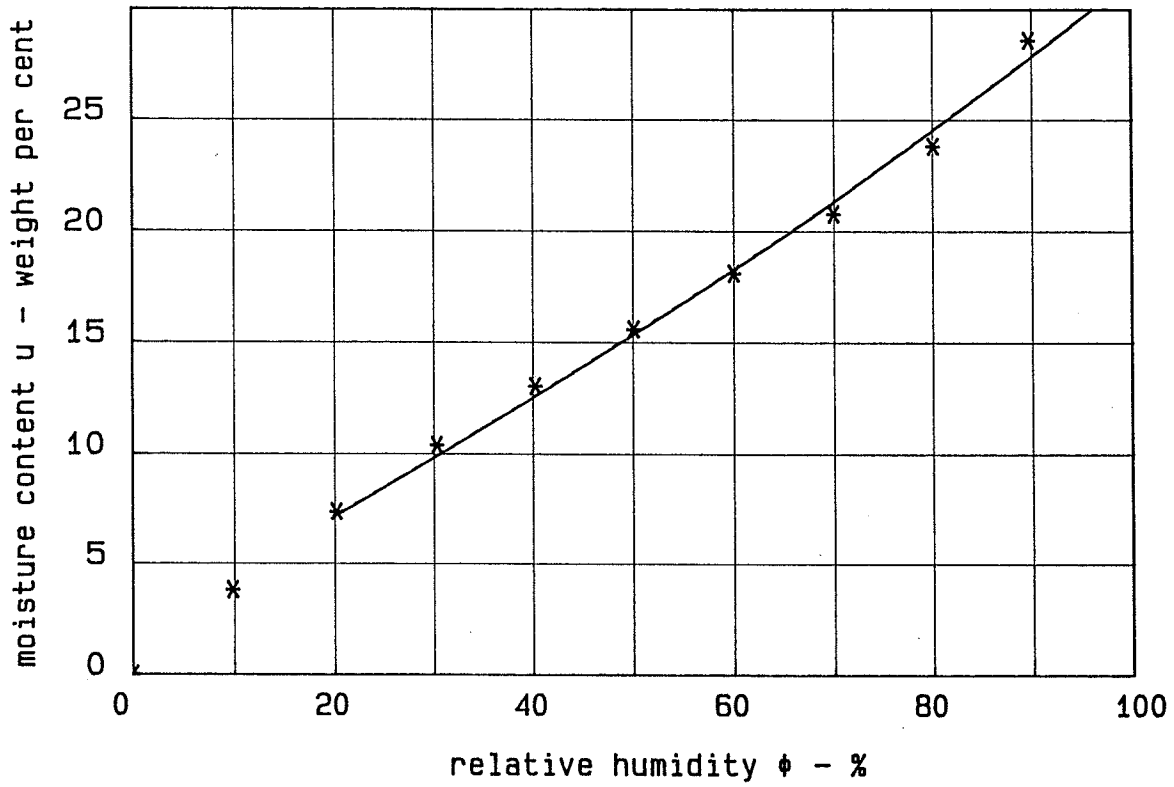
Notes: Clear coating of Vinyl lacquer.Solids: Vinylite VYHH.

Litterature: Yaseen, M., Funke, W.: Effect of temperature on water absorption and permeation properties of coatings. J. Oil Col. Chem. Assoc. 61, 1978.

Date: 24- 3-86 Initials: KKH File: \L\LACQUEV

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LEATHER 0 kg/m^3 0.0°C



* measured sorption values

ϕ	0.0	9.9	20.2	30.4	40.3	50.1	60.0	70.0	80.1	89.7
u	0.0	3.8	7.4	10.4	13.0	15.6	18.1	20.8	23.8	28.6

Approximation:

u= 3.14E+01*exp((-1/0.29)*ln(1-ln(ϕ)/ 2.98E+00))

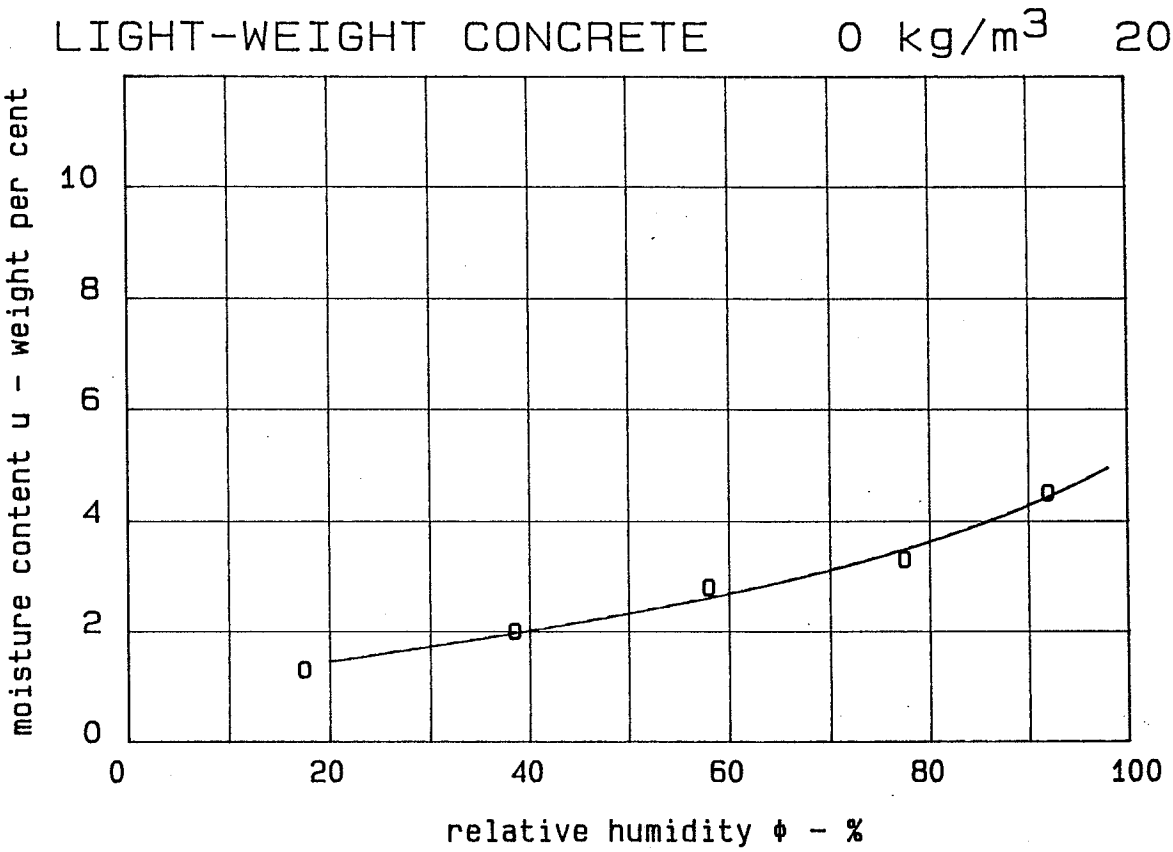
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: \L\LEATHER

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ 17.5 38.5 58.0 77.5 92.0
u 1.30 2.00 2.80 3.30 4.50
Approximation:
u= 5.15E+00*exp((-1/1.28)*ln(1-ln(ϕ)/ 3.94E-01))

No scanning values

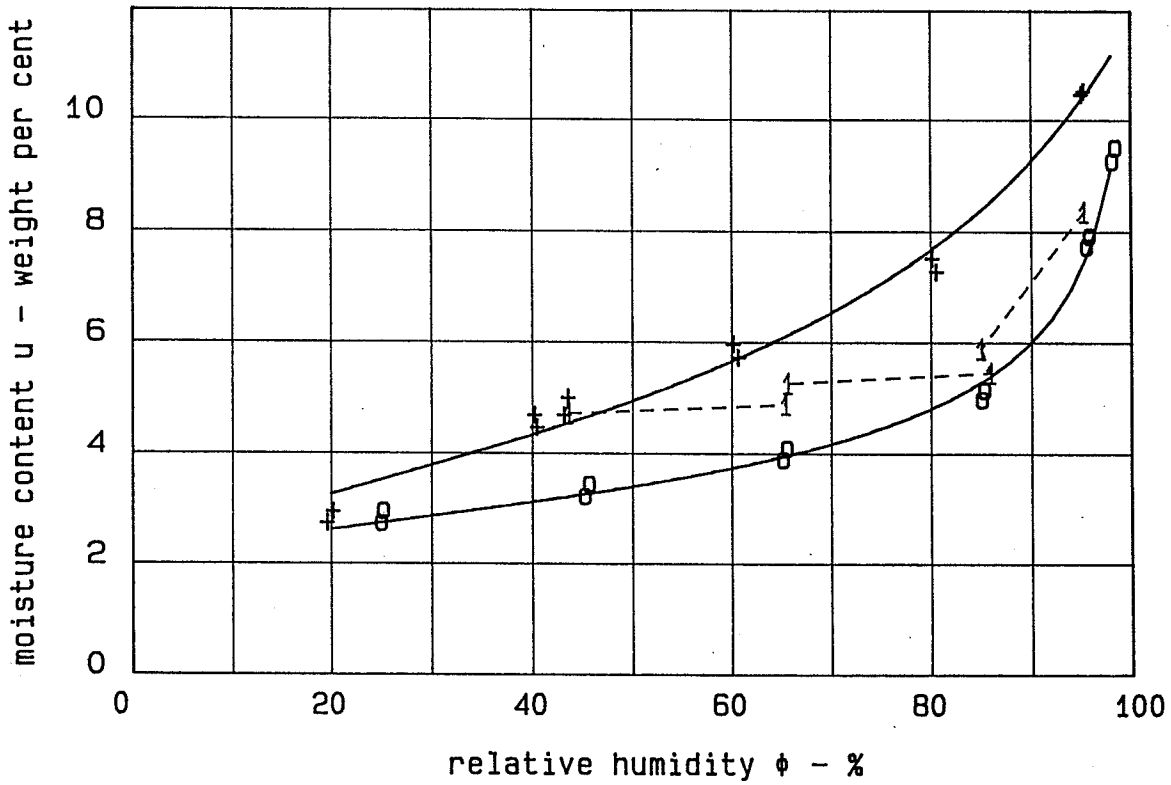
Notes: Concrete with expanded clay aggregate, C=170 kg/m3, w/c=0.50, wn/C=0.22.
Density not indicated.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 18- 4-86 Initials: KKH File: \L\LWCONC20.

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LIGHT-WEIGHT CONCRETE 640 kg/m^3 20.0°C



\+ measured desorption values

ϕ	95.2	95.0	80.1	80.5	60.1	60.7	43.5	43.1	40.2	40.4	20.1	19.6
u	10.5	10.5	7.5	7.3	6.0	5.7	5.0	4.7	4.7	4.5	2.9	2.7

Approximation:
u= 1.18E+01*exp((-1/1.67)*ln(1-ln(ϕ)/ 2.13E-01))

o measured adsorption values

ϕ	25.0	25.2	45.2	45.6	65.2	65.5	85.1	85.3	95.5	95.8	98.1	98.5
u	2.7	3.0	3.2	3.4	3.9	4.1	5.0	5.2	7.7	7.9	9.3	9.5

Approximation:
u= 1.27E+01*exp((-1/3.17)*ln(1-ln(ϕ)/ 1.09E-02))

1 measured scanning values

ϕ	43.5	65.4	65.6	85.9	84.9	95.2
u	4.7	4.9	5.3	5.5	5.9	8.4

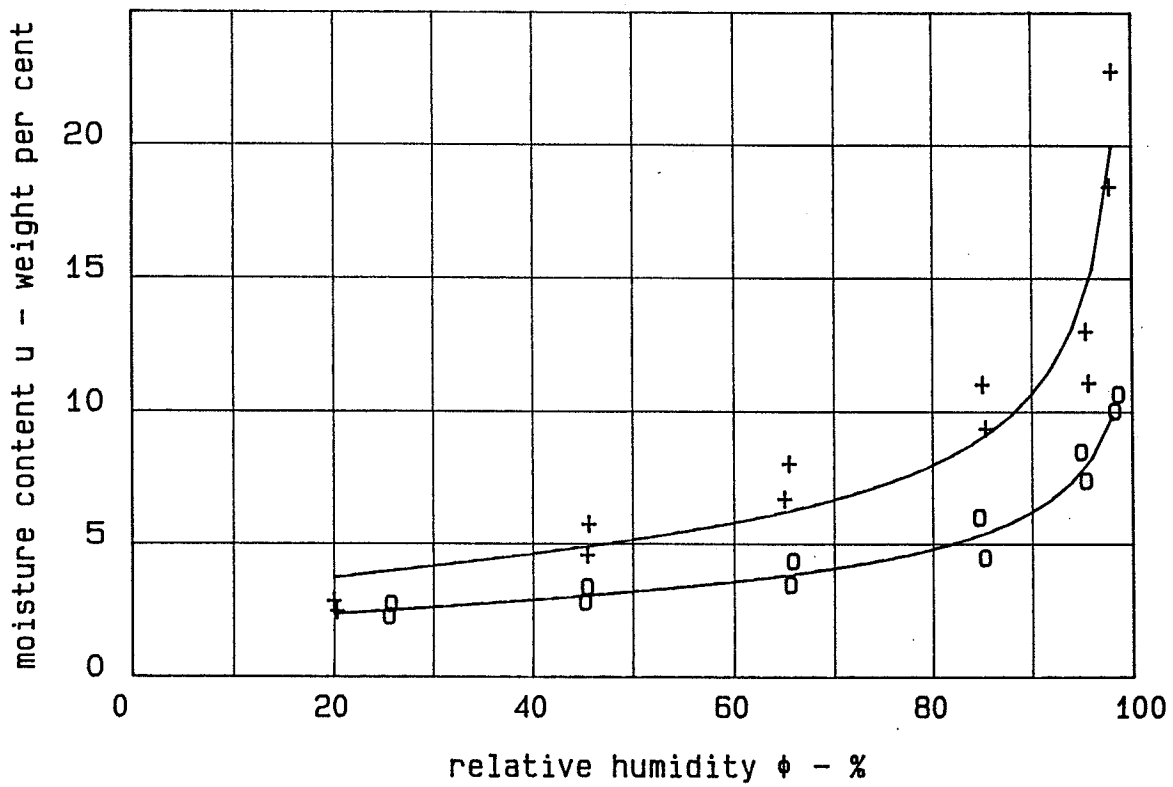
Notes: Concrete with expanded clay aggregate, open porosity=47%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 8-10-85 Initials: KKH File: \L\LWCONC20.640

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LIGHT-WEIGHT CONCRETE 670 kg/m^3 20.0°C



\+ measured desorption values

ϕ	98.0	97.7	95.3	95.7	85.0	85.4	65.5	65.0	45.6	45.4	20.0	20.3
u	22.8	18.5	13.0	11.1	11.0	9.4	8.0	6.7	5.7	4.6	2.8	2.5

Approximation:
u= 7.35E+01*exp((-1/2.59)*ln(1-ln(ϕ)/ 7.16E-04))

o measured adsorption values

ϕ	25.5	25.7	45.2	45.4	65.6	65.9	85.3	84.7	95.4	94.9	98.3	98.6
u	2.3	2.7	2.8	3.4	3.5	4.4	4.5	6.0	7.4	8.5	10.0	10.7

Approximation:
u= 1.35E+01*exp((-1/2.68)*ln(1-ln(ϕ)/ 1.51E-02))

No scanning values

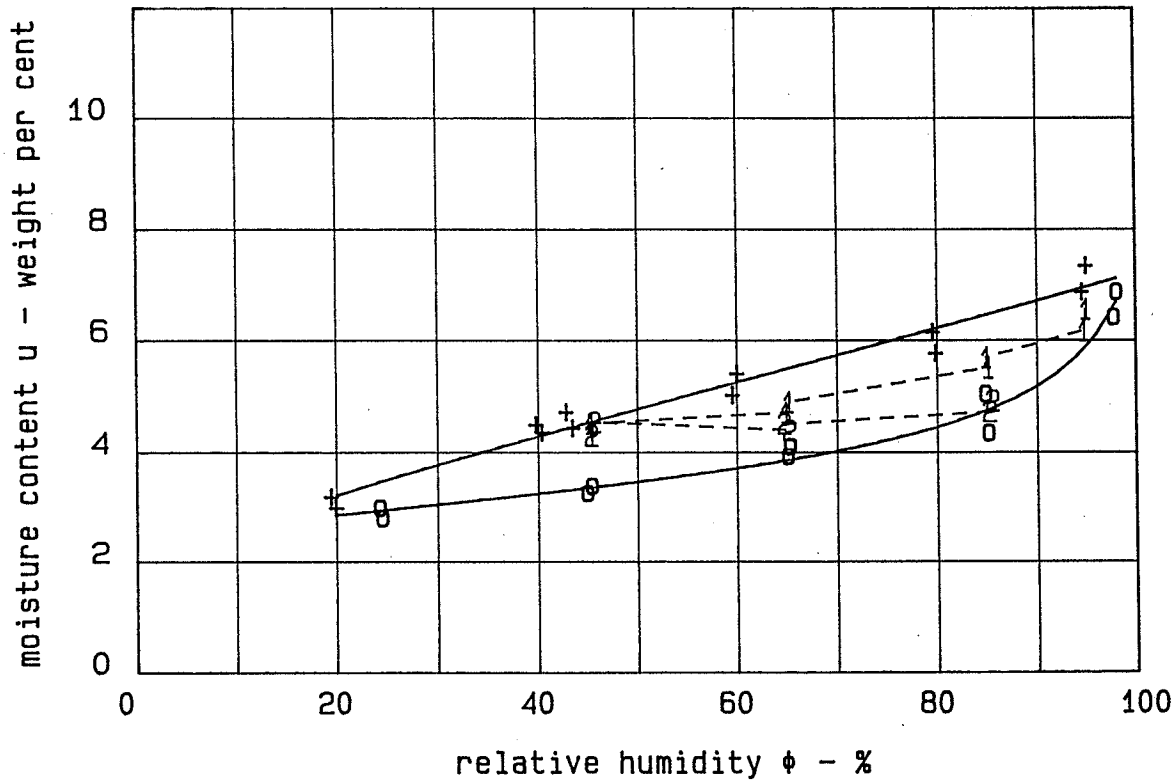
Notes: Concrete with expanded clay aggregate, C=270 kg/m3, std., w/c=0.46, wn/C=0.23, porous aggregate=210 kg/m3, sand=120 kg/m3.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 8-10-85 Initials: KKH File: \L\LWCONC20.670

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LIGHT-WEIGHT CONCRETE 1200 kg/m^3 20.0°C



\+ measured desorption values

ϕ	94.9	94.5	79.5	79.8	60.0	59.5	42.8	43.4	39.7	40.4	19.4	19.9
u	7.3	6.9	6.1	5.8	5.4	5.0	4.7	4.4	4.5	4.4	3.2	3.0

Approximation:
u= 7.21E+00*exp((-1/0.79)*ln(1-ln(ϕ)/ 1.82E+00))

o measured adsorption values

ϕ	24.5	24.3	44.9	45.4	65.1	65.3	85.1	84.8	97.8	98.1
u	2.8	3.0	3.3	3.4	3.9	4.1	4.3	5.0	6.4	6.9

Approximation:
u= 7.71E+00*exp((-1/4.24)*ln(1-ln(ϕ)/ 2.42E-02))

1 measured scanning values

ϕ	94.9	94.7	84.9	85.1	65.1	64.9	45.2	45.3
u	6.6	6.2	5.7	5.5	4.9	4.7	4.5	4.3

2 measured scanning values

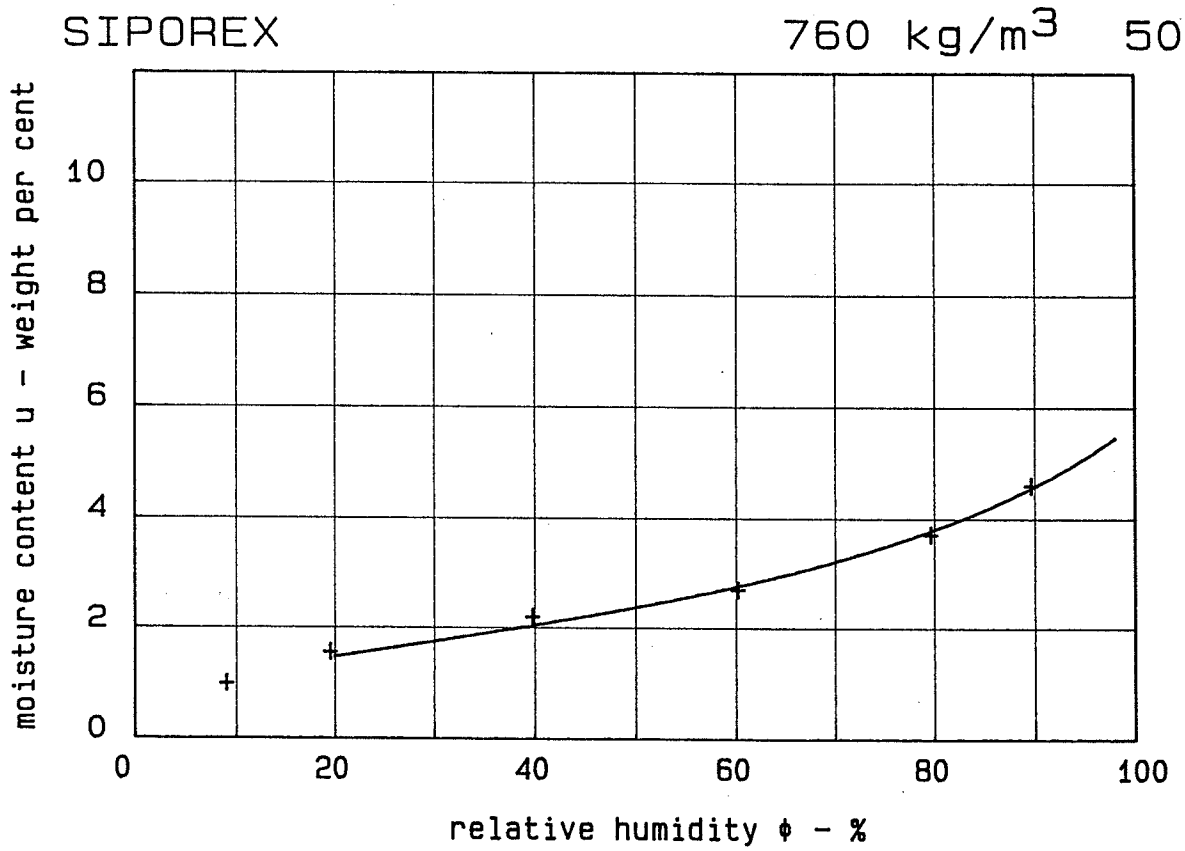
ϕ	45.3	45.6	65.2	64.7	85.2	85.5
u	4.3	4.5	4.4	4.5	4.7	4.9

Notes: Concrete with expanded clay aggregate, 1200 kg/m3, open porosity=45%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 8-10-85 Initials: KKH File: \L\LWCONC20.120

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	89.7	79.6	60.2	39.8	19.5	9.1
u	4.60	3.71	2.70	2.20	1.56	0.99

Approximation:

$u = 5.73E+00 * \exp((-1/1.38) * \ln(1-\ln(\phi) / 2.94E-01))$

No scanning values

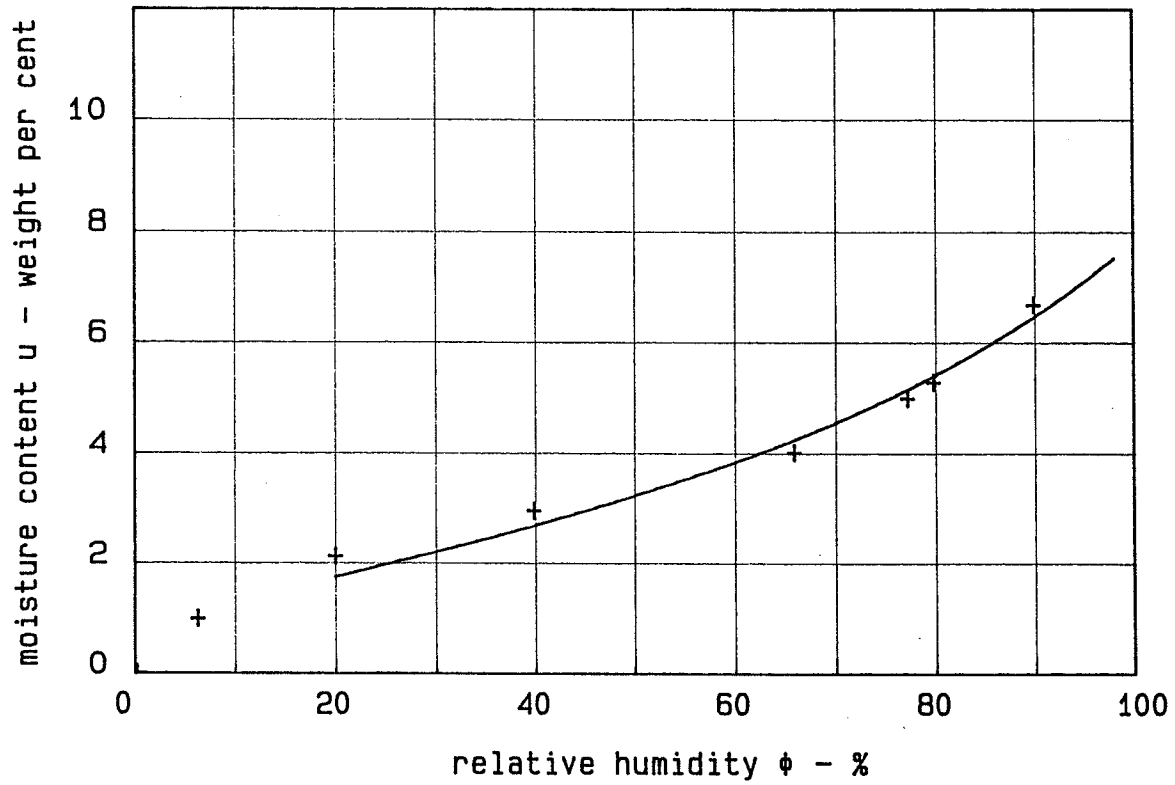
Notes:

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \M_U\SIPOREXK.760

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

YTONG Siporex 520 kg/m^3 50.0 °C



\+ measured desorption values

ϕ	89.9	79.8	77.1	65.8	39.8	20.0	6.3	0.2
u	6.68	5.28	4.99	4.01	2.94	2.12	0.99	0.00

Approximation:

u= 7.82E+00*exp((-1/0.89)*ln(1-ln(ϕ)/ 5.82E-01))

No scanning values

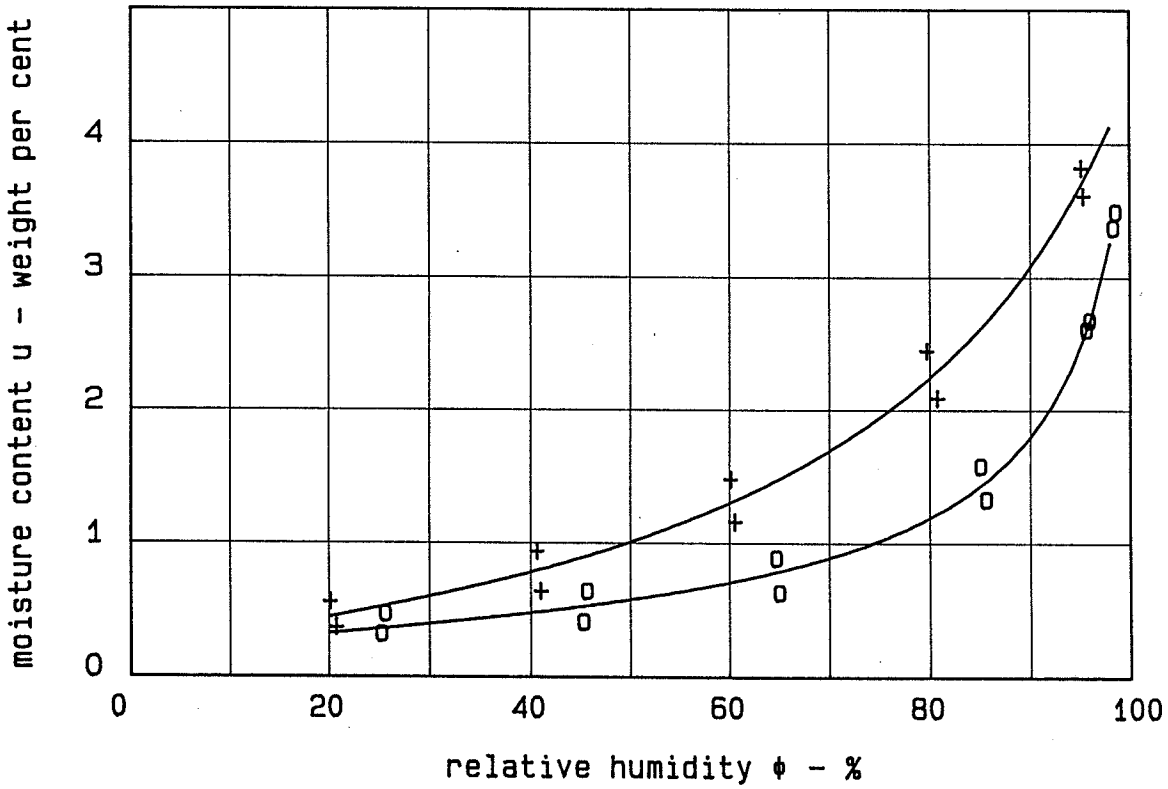
Notes:

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \V_Z\YTONGKRI.520

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LIMECEMENTMORTAR 1800 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	95.1	95.3	79.7	80.8	60.1	60.5	40.6	41.0	20.1	20.7
u	3.82	3.61	2.45	2.09	1.48	1.16	0.94	0.64	0.56	0.37

Approximation:
u= 4.47E+00*exp((-1/0.80)*ln(1-ln(ϕ)/ 3.07E-01))

o measured adsorption values

ϕ	25.2	25.6	45.3	45.6	65.0	64.7	85.6	85.0	95.6	95.9	98.3	98.6
u	0.32	0.47	0.41	0.64	0.63	0.89	1.33	1.58	2.61	2.68	3.37	3.49

Approximation:
u= 4.22E+00*exp((-1/1.40)*ln(1-ln(ϕ)/ 4.61E-02))

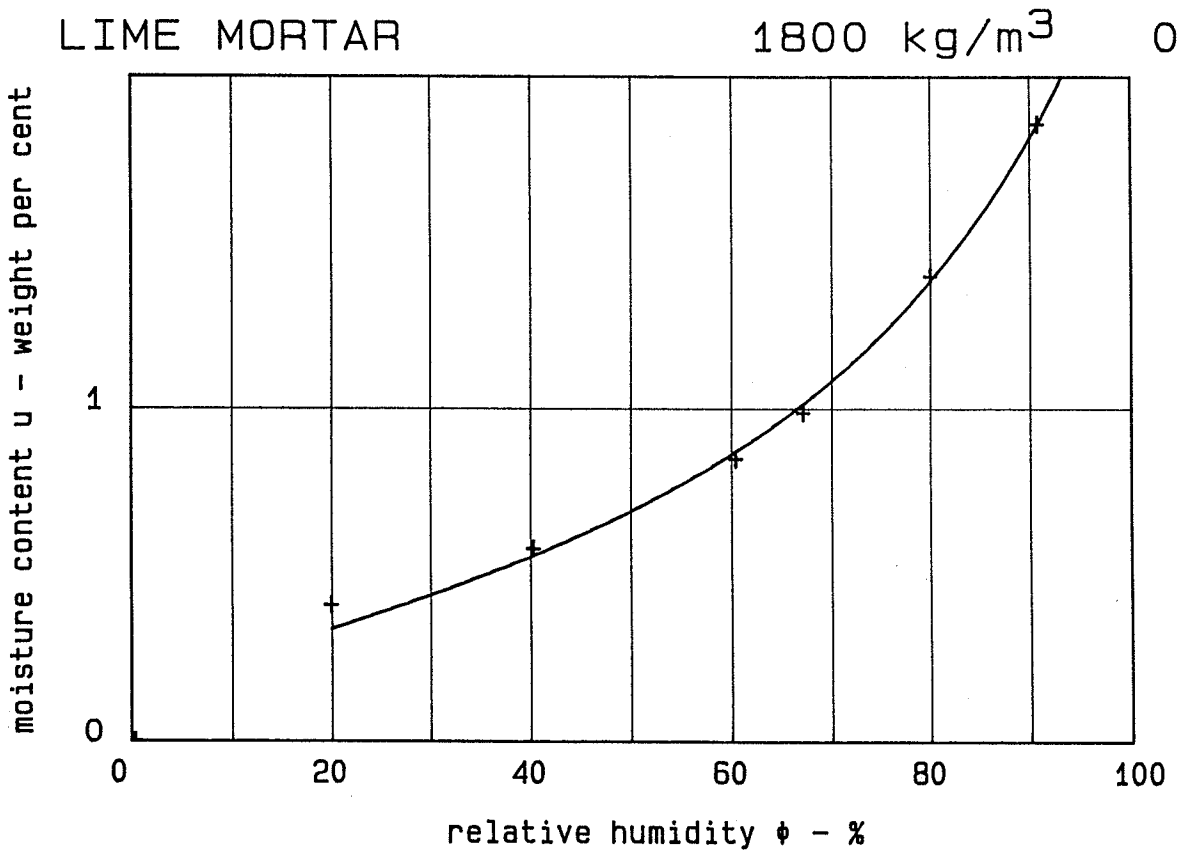
No scanning values

Notes: Lime-cement mortar 35/65/550, open porosity=31%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 7-10-85 Initials: KKH File: \L\LICEM020.550

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	90.7	79.9	67.1	60.3	40.2	19.9	0.4
u	1.86	1.40	0.99	0.85	0.58	0.41	0.00

Approximation:

$u = 2.49E+00 * \exp((-1/0.89) * \ln(1-\ln(\phi) / 3.25E-01))$

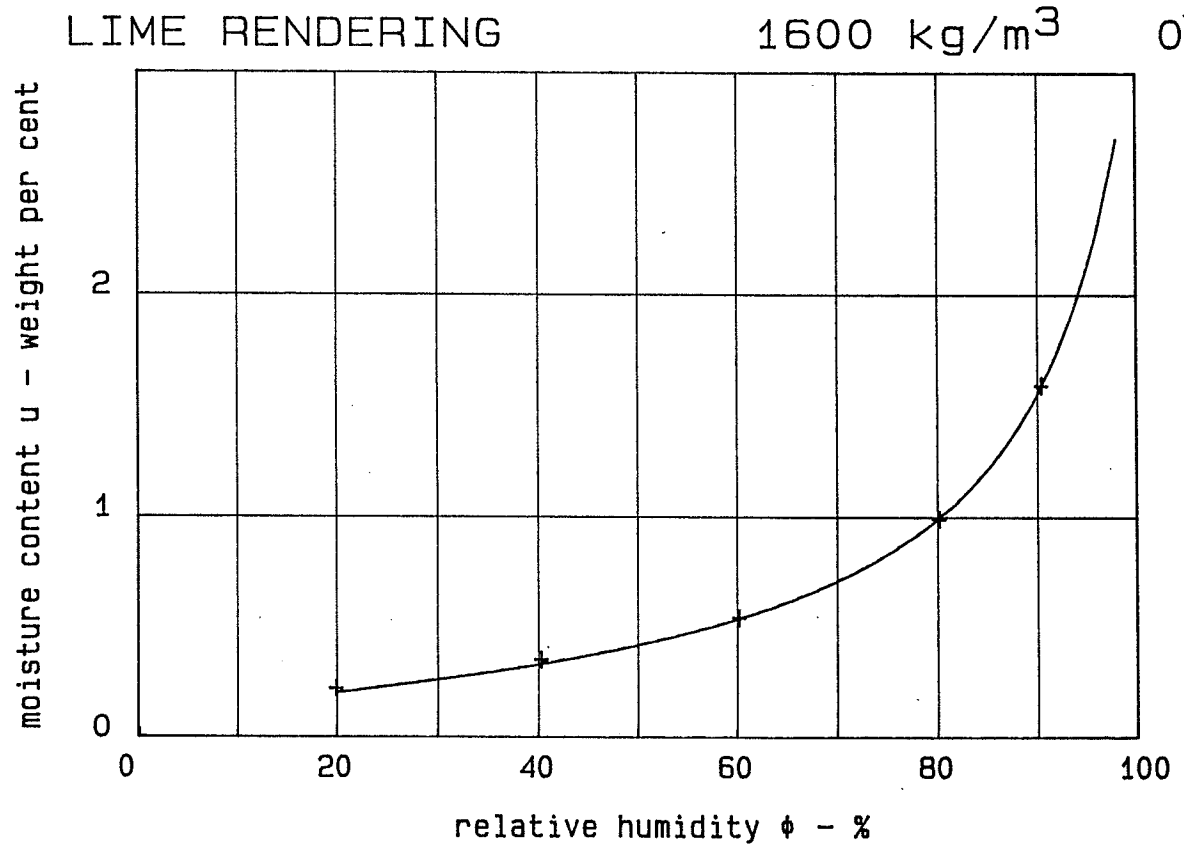
No scanning values

Notes: Temperature not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg.1963.

Date: 16-10-85 Initials: KKH File: \L\LIMMORTK.180

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	90.3	80.1	60.1	40.2	19.9	0.1
u	1.6	1.0	0.5	0.4	0.2	0.0

Approximation:

u= 3.29E+00*exp((-1/1.07)*ln(1-ln(ϕ)/ 8.57E-02))

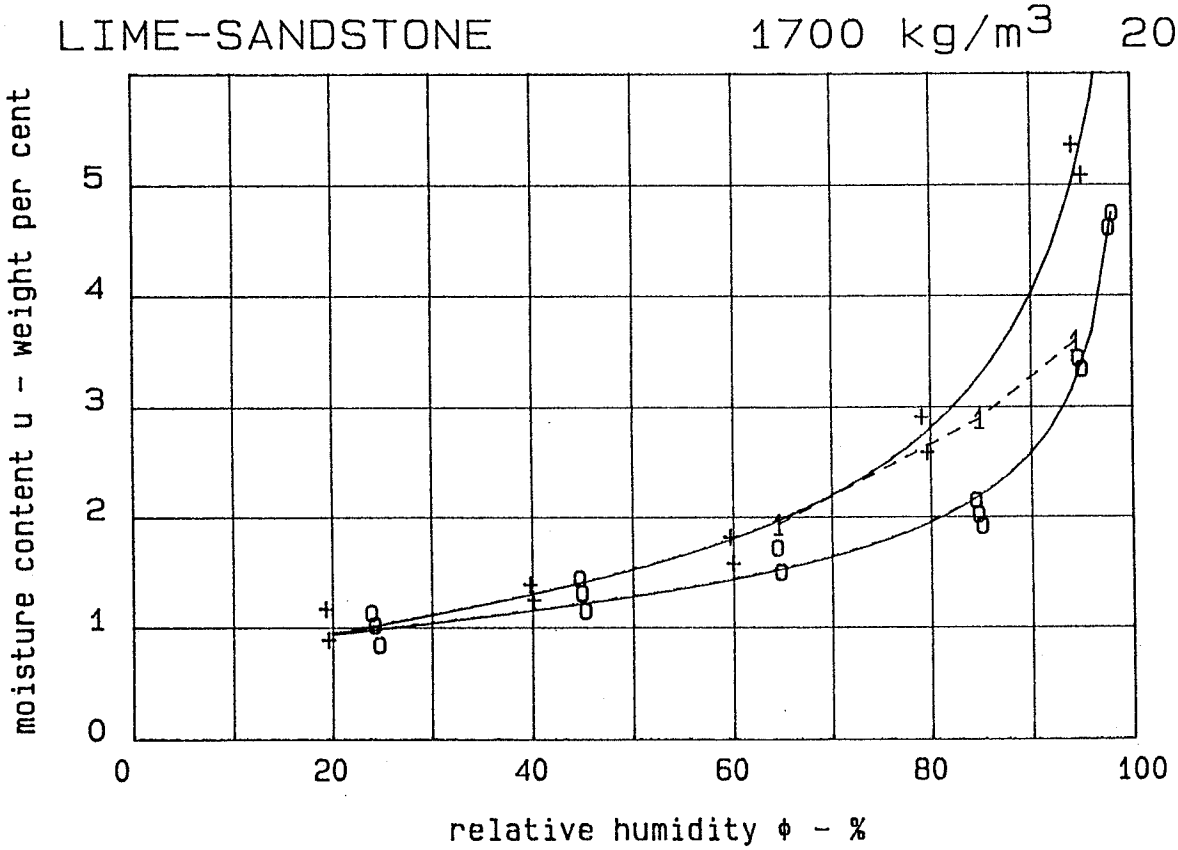
No scanning values

Notes: Temperature not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \L\LIMPLASK.160

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ 94.1 95.0 79.1 79.7 59.7 60.0 39.7 40.1 19.3 19.6
u 5.36 5.09 2.91 2.59 1.82 1.58 1.39 1.25 1.17 0.89
Approximation:
u= 9.02E+00*exp((-1/1.70)*ln(1-ln(ϕ)/ 3.58E-02))

o measured adsorption values

ϕ 24.7 24.2 23.9 45.2 44.9 44.6 64.8 64.5 85.1 84.7 84.5 95.0 94.6 97.7 98.0
u 0.84 1.02 1.13 1.15 1.31 1.44 1.50 1.72 1.92 2.02 2.15 3.34 3.44 4.61 4.74
Approximation:
u= 1.85E+01*exp((-1/2.69)*ln(1-ln(ϕ)/ 5.34E-04))

1 measured scanning values

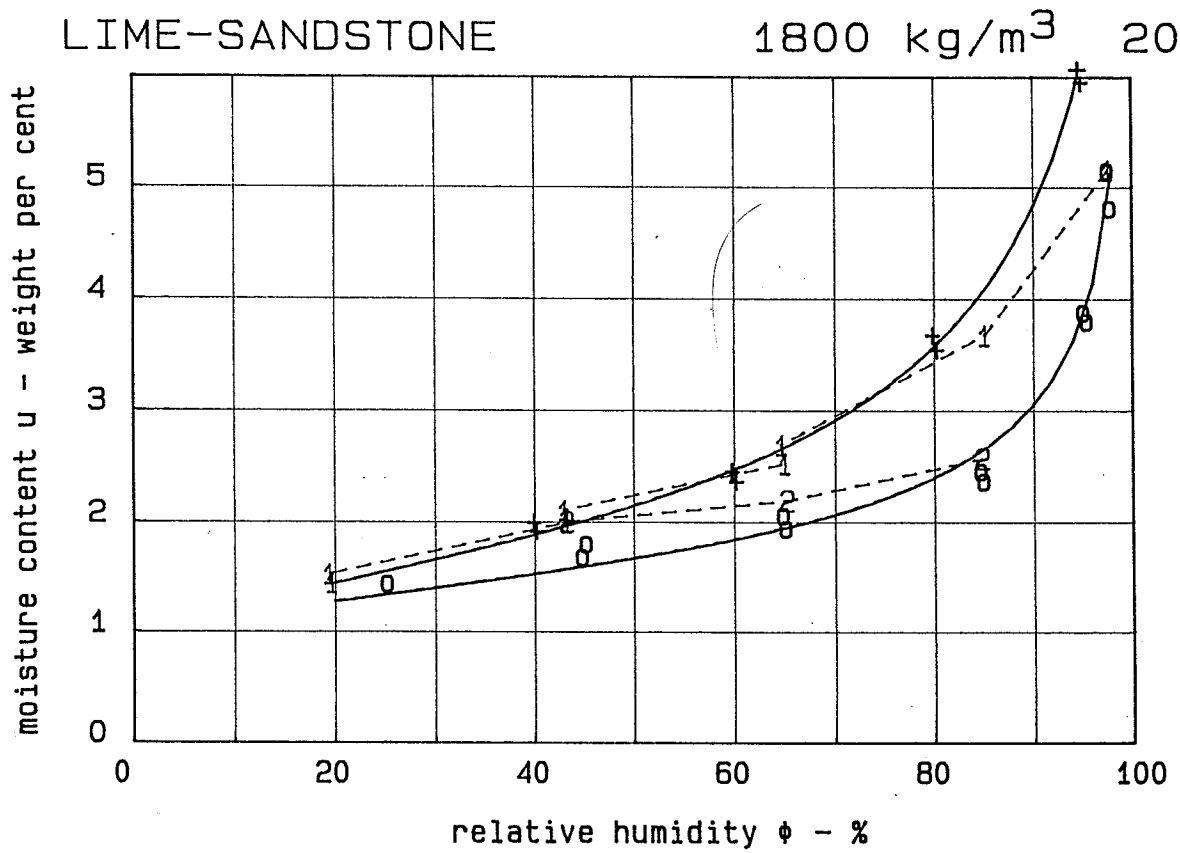
ϕ 94.4 84.8 64.5
u 3.59 2.89 1.93

Notes: Open porosity=34%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: limsan20.170

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	94.5	94.9	79.8	80.3	59.8	60.2	39.9	40.2
u	6.14	5.95	3.67	3.54	2.45	2.36	1.99	1.91

Approximation:
u= 9.61E+00*exp((-1/2.04)*ln(1-ln(ϕ)/ 3.42E-02))

o measured adsorption values

ϕ	25.2	44.8	45.2	65.1	64.8	84.9	84.7	95.4	95.0	97.7	97.5
u	1.43	1.67	1.79	1.93	2.05	2.36	2.45	3.79	3.87	4.80	5.14

Approximation:
u= 1.49E+01*exp((-1/3.11)*ln(1-ln(ϕ)/ 7.68E-04))

1 measured scanning values

ϕ	97.5	85.0	64.6	65.0	42.9	43.2	19.3	19.6
u	5.15	3.67	2.69	2.52	2.10	1.99	1.52	1.44

2 measured scanning values

ϕ	43.2	65.2	84.8
u	2.00	2.19	2.57

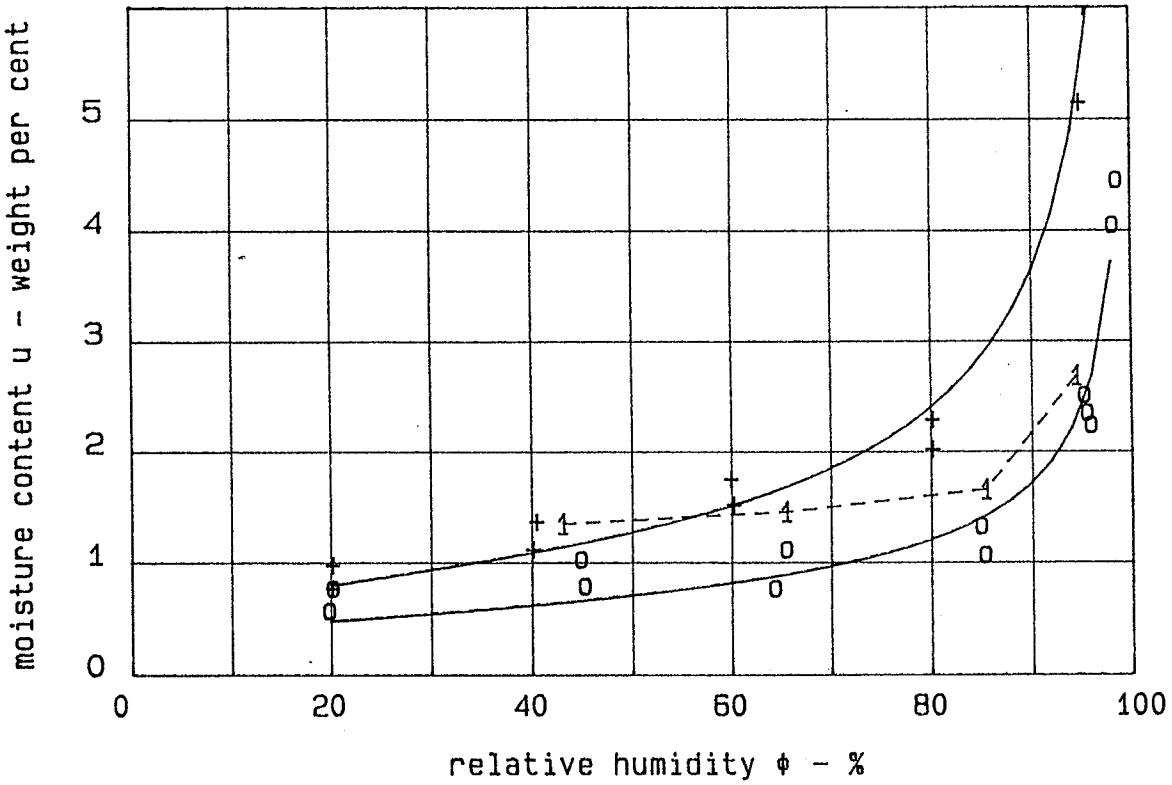
Notes: Open porosity=29%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: \L\LIMSAN20.180

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LIME-SANDSTONE 1830 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 95.4 94.9 80.1 80.1 60.0 60.2 40.4 40.1 20.2 20.2
u 6.00 5.15 2.29 2.02 1.75 1.52 1.37 1.12 0.98 0.77
Approximation:
u= 3.97E+01*exp((-1/1.79)*ln(1-ln(ϕ)/ 1.49E-03))

o measured adsorption values

ϕ 20.2 19.8 45.2 44.8 64.3 65.5 85.3 84.9 95.9 95.5 95.2 98.2 98.6
u 0.77 0.57 0.79 1.03 0.77 1.12 1.07 1.33 2.24 2.35 2.51 4.05 4.45
Approximation:
u= 2.45E+01*exp((-1/2.13)*ln(1-ln(ϕ)/ 3.72E-04))

1 measured scanning values

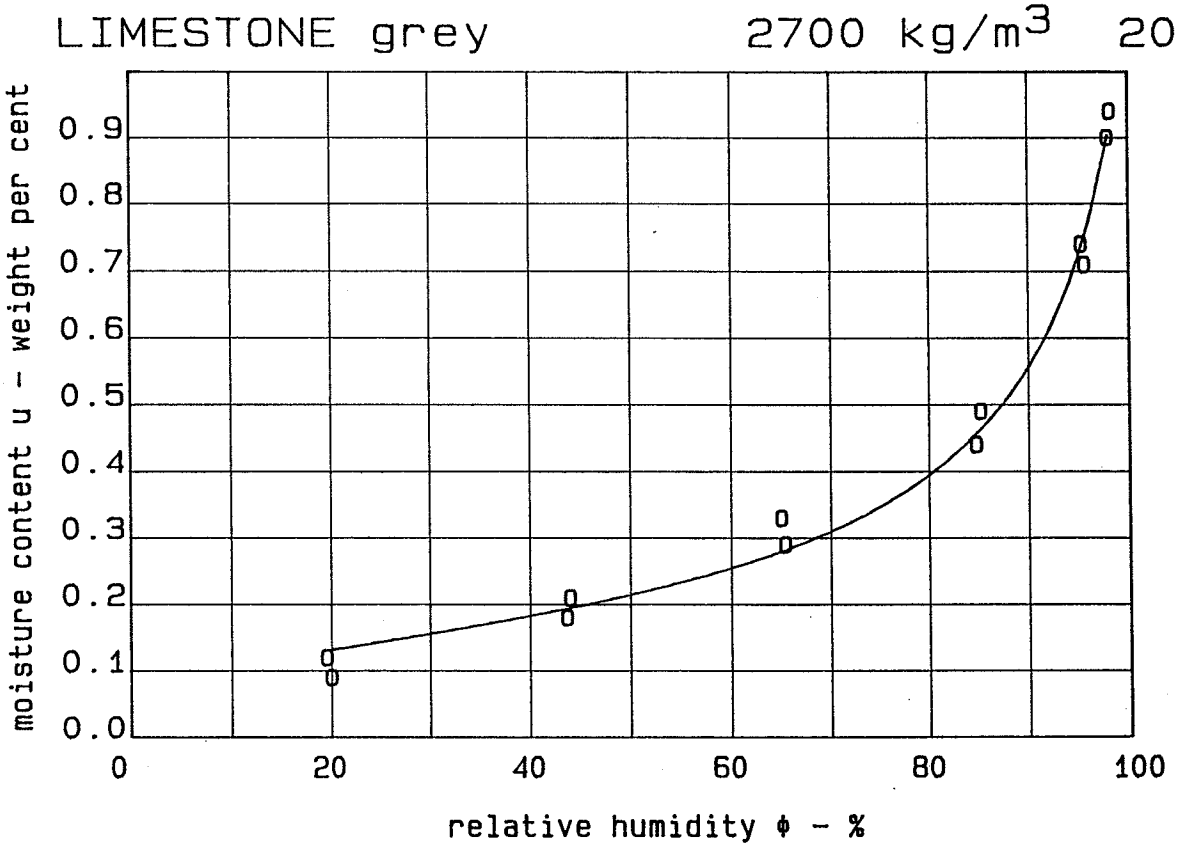
ϕ 43.0 65.5 85.5 94.5
u 1.35 1.46 1.66 2.69

Notes: Open porosity=31%.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of techn. Report 36, Lund, Sweden, 1972.

Date: 4-10-85 Initials: KKH File: limsan20.183

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	19.9	19.5	43.6	43.9	65.4	65.0	84.7	85.2	95.5	95.2	97.9	98.2
u	0.09	0.12	0.18	0.21	0.29	0.33	0.44	0.49	0.71	0.74	0.90	0.94

Approximation:

u= 1.11E+00*exp((-1/1.65)*ln(1-ln(ϕ)/ 5.02E-02))

No scanning values

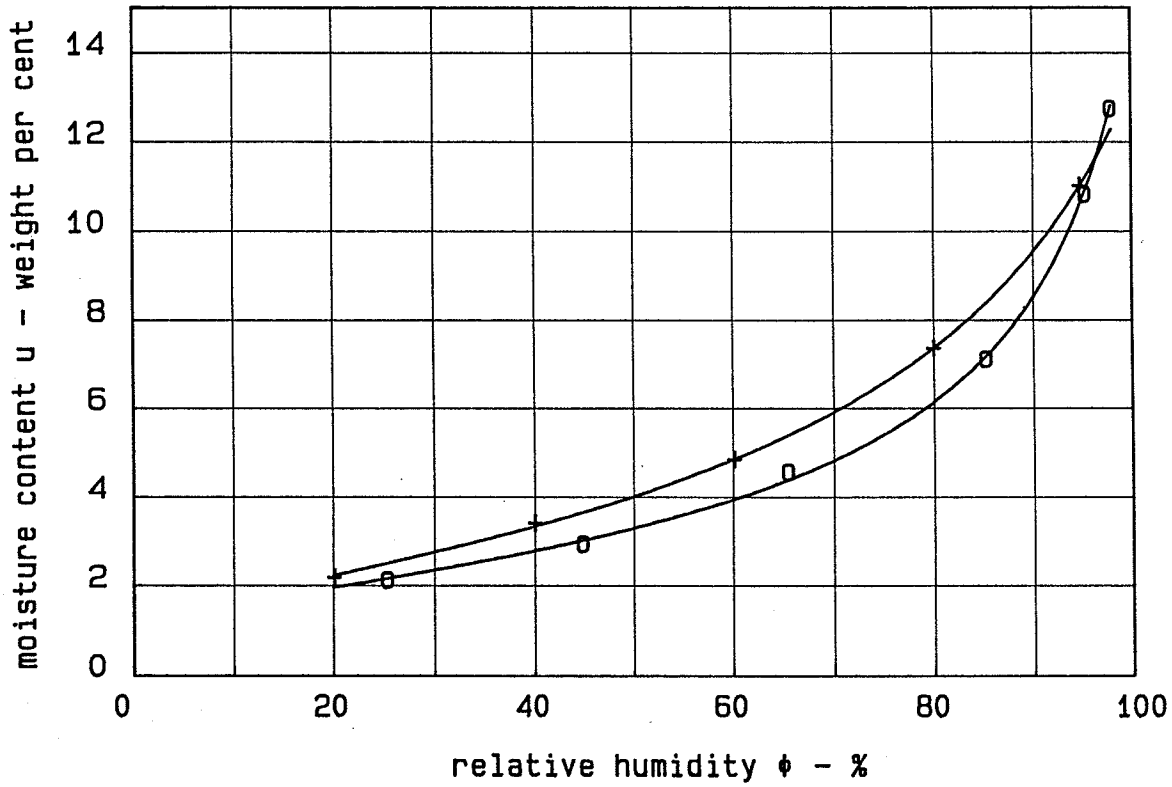
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: \1\limest20.270

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

LINOLEUM CARPET 2 mm. 1200 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	94.7	80.0	60.1	40.0	20.1
u	11.0	7.4	4.9	3.4	2.2

Approximation:
u= 1.32E+01*exp((-1/1.18)*ln(1-ln(ϕ)/ 2.26E-01))

o measured adsorption values

ϕ	25.3	44.9	65.5	85.2	95.2	97.9
u	2.1	2.9	4.6	7.1	10.8	12.8

Approximation:
u= 1.49E+01*exp((-1/1.51)*ln(1-ln(ϕ)/ 7.95E-02))

No scanning values

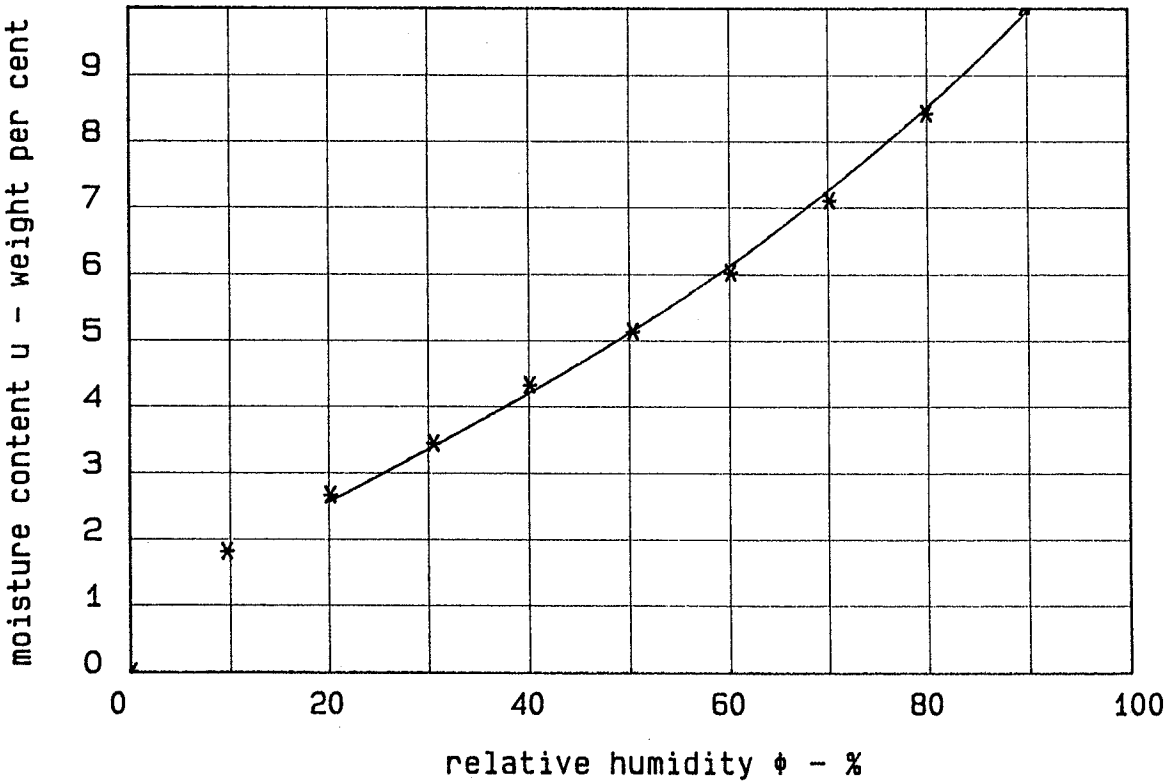
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \L\LINCAR20.120

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

FILTER PAPER 0 kg/m^3 0.0°C



* measured sorption values

ϕ	0.1	9.7	20.2	30.5	40.1	50.4	60.1	70.2	80.0	89.8
u	0.0	1.8	2.7	3.5	4.3	5.1	6.0	7.1	8.4	10.0

Approximation:

u= 1.16E+01*exp((-1/0.59)*ln(1-ln(ϕ)/ 1.11E+00))

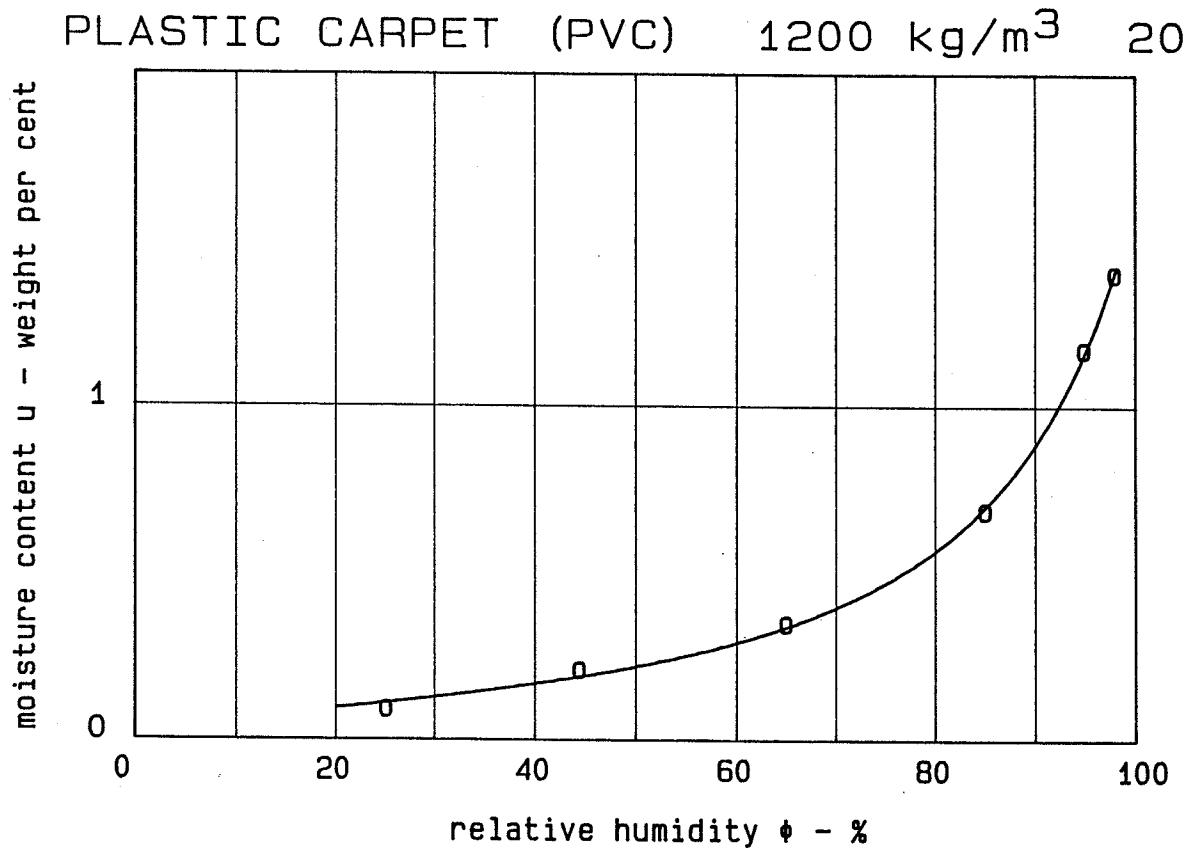
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: filtpape

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	25.0	44.4	64.9	85.0	94.8	97.9
u	0.09	0.21	0.35	0.69	1.17	1.40

Approximation:
u= 1.63E+00*exp((-1/0.86)*ln(1-ln(ϕ)/ 1.54E-01))

No scanning values

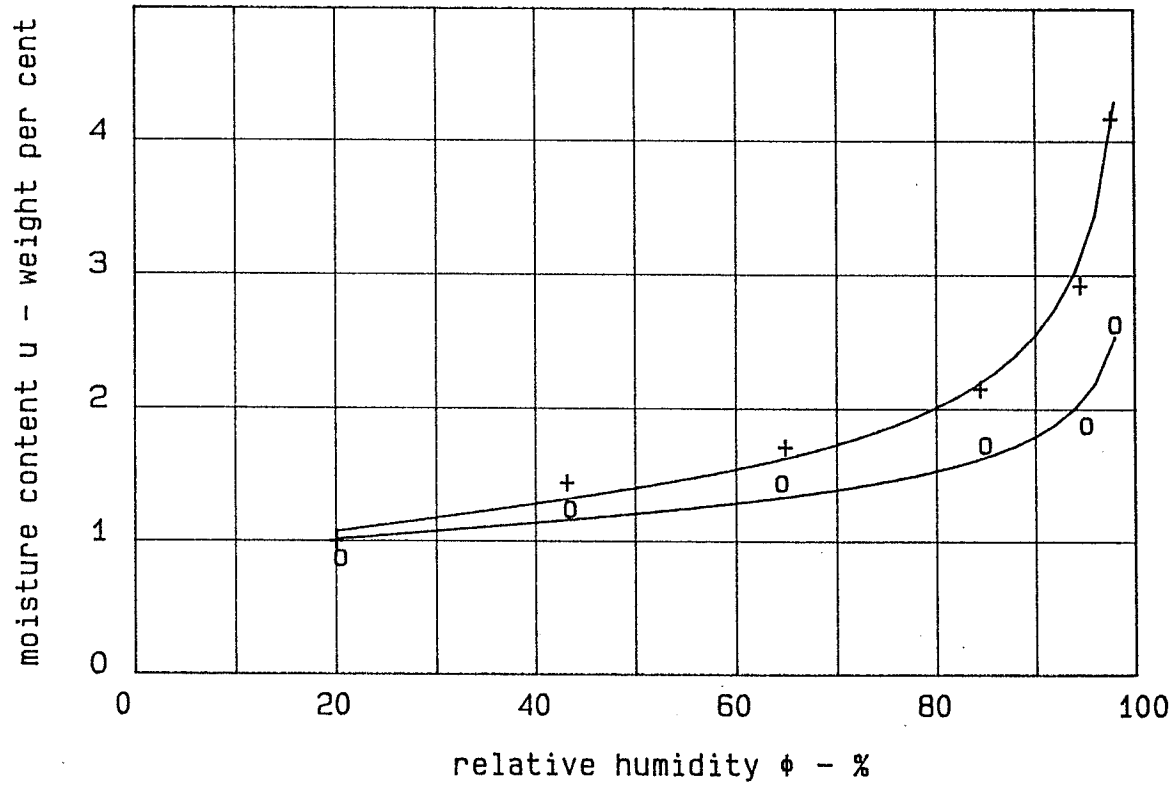
Notes: Plastic carpet (PVC) 3 mm.

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \M_U\PLACAR20.120

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

GLASS WOOL 18 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 97.6 94.5 84.4 64.8 43.1 20.0
u 4.17 2.92 2.15 1.71 1.44 1.00
Approximation:
u= 1.40E+01*exp((-1/3.14)*ln(1-ln(ϕ)/ 5.11E-04))

o measured adsorption values

ϕ 20.4 43.4 64.5 84.9 95.1 98.0
u 0.87 1.24 1.44 1.73 1.88 2.63
Approximation:
u= 5.45E+00*exp((-1/4.75)*ln(1-ln(ϕ)/ 5.48E-04))

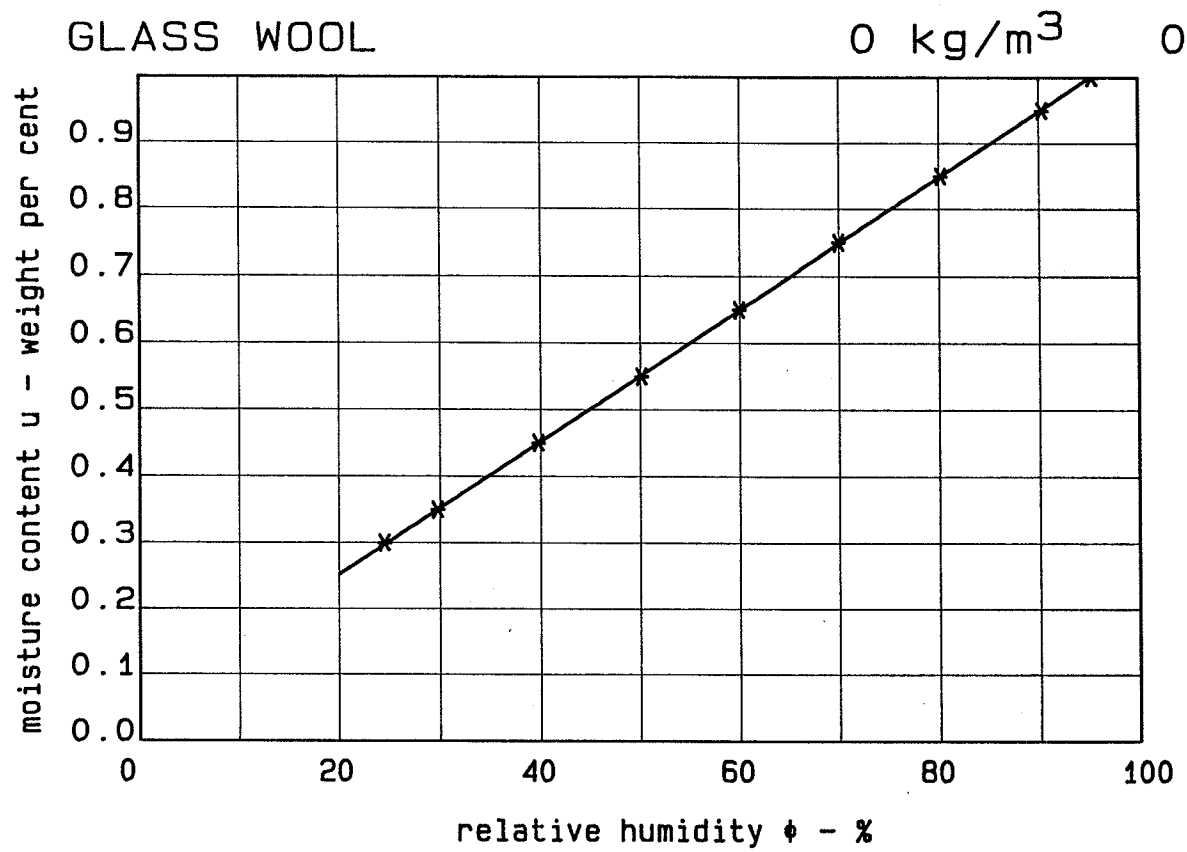
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: glwool20.018

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	24.5	29.8	39.8	50.1	60.0	70.0	80.2	90.3	95.3
u	0.30	0.35	0.45	0.55	0.65	0.75	0.85	0.95	1.00

Approximation:

u= 1.05E+00*exp((-1/0.12)*ln(1-ln(ϕ)/ 9.01E+00))

No scanning values

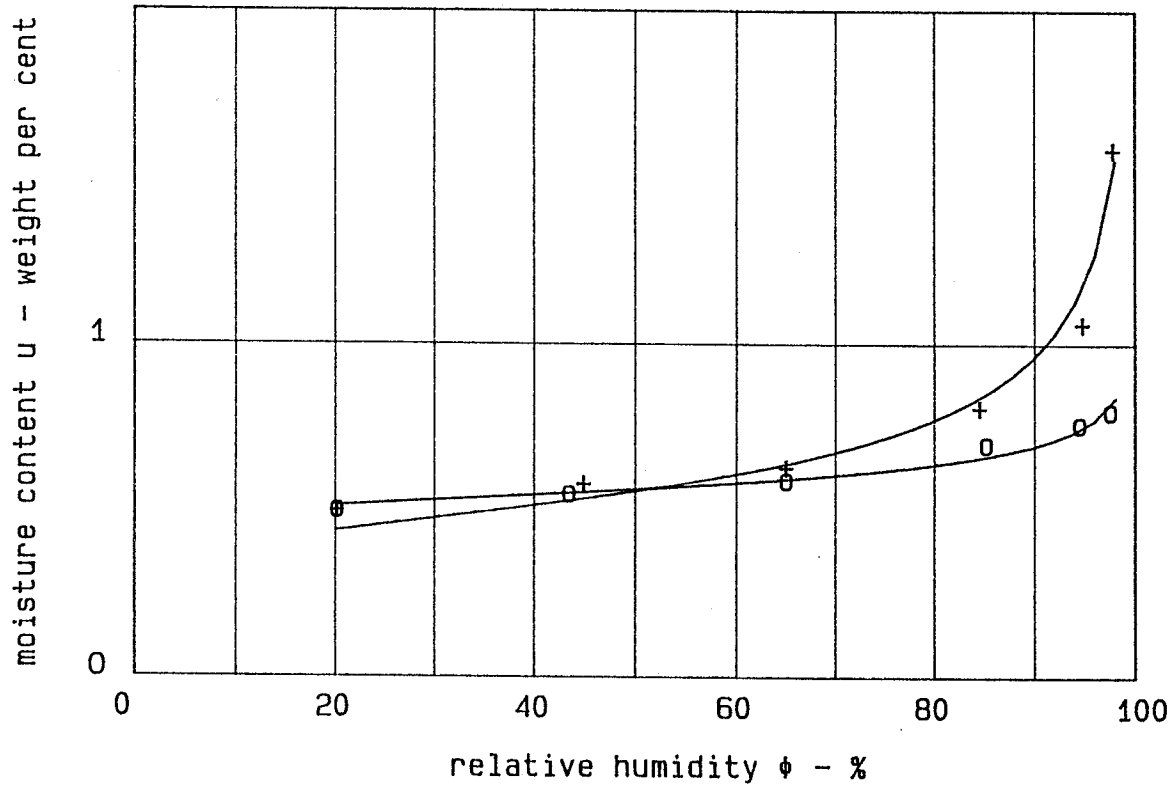
Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: glaswool

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

ROCK WOOL 42 kg/m^3 20.0 °C



\+ measured desorption values

ϕ 97.8 94.7 84.5 64.9 44.9 20.1
u 1.58 1.06 0.81 0.63 0.58 0.50
Approximation:
u= 4.42E+00*exp((-1/3.45)*ln(1-ln(ϕ)/ 5.58E-04))

o measured adsorption values

ϕ 20.1 43.4 65.0 85.2 94.5 97.5
u 0.50 0.55 0.59 0.70 0.76 0.80
Approximation:
u= 2.73E+00*exp((-1/8.88)*ln(1-ln(ϕ)/ 5.91E-07))

No scanning values

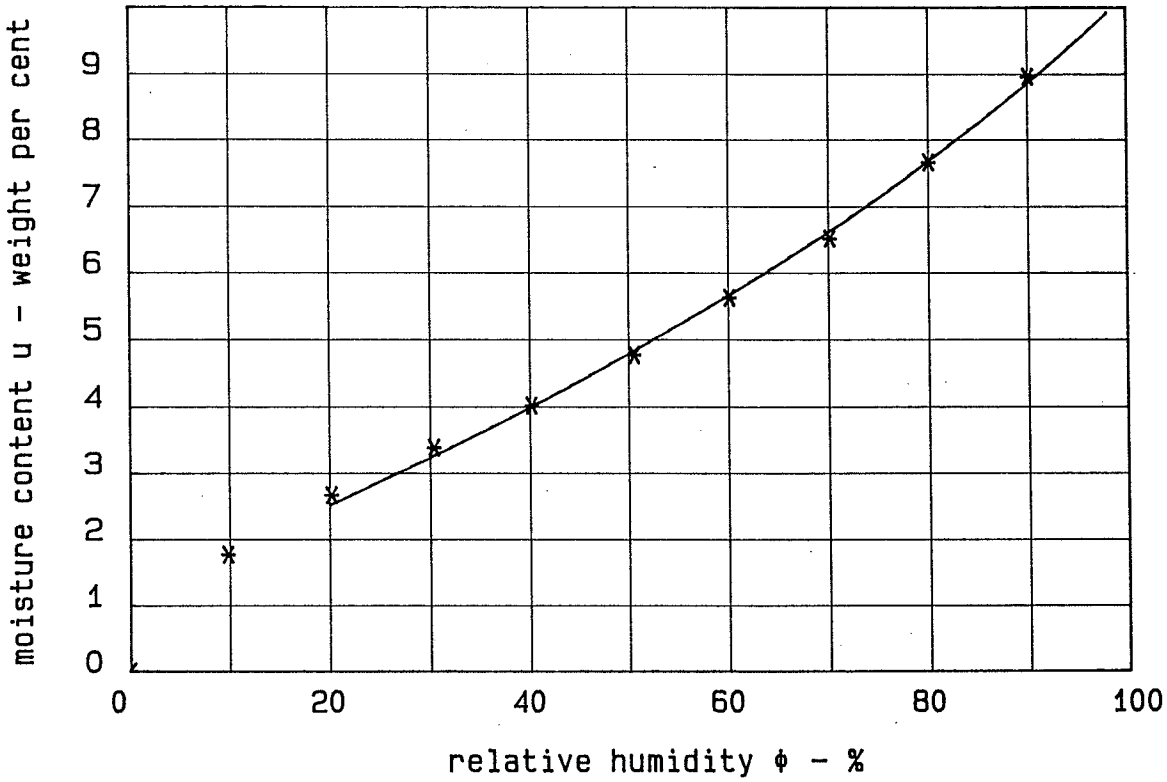
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: rowool20.042

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

NEWSPRINT 0 kg/m^3 0.0 °C



* measured sorption values

ϕ	0.0	9.9	20.1	30.4	40.1	50.5	60.1	70.1	80.0	90.0
u	0.00	1.76	2.66	3.38	4.01	4.76	5.62	6.51	7.65	8.95

Approximation:

u= 1.02E+01*exp((-1/0.63)*ln(1-ln(ϕ)/ 1.15E+00))

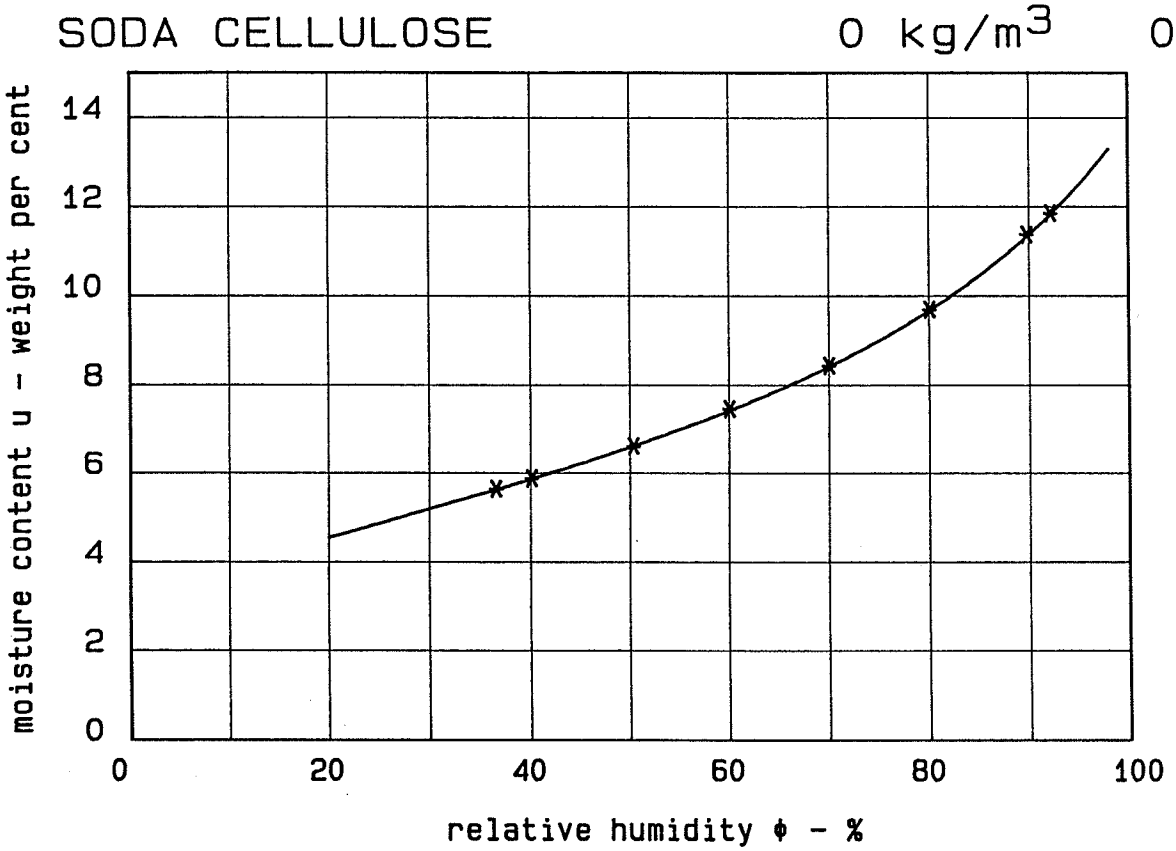
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: \m_U\newsprin

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	36.6	40.1	50.4	60.1	70.1	80.1	89.8	92.2
u	5.6	5.9	6.6	7.5	8.4	9.7	11.4	11.9

Approximation:

u= 1.39E+01*exp((-1/1.84)*ln(1-ln(ϕ)/ 2.35E-01))

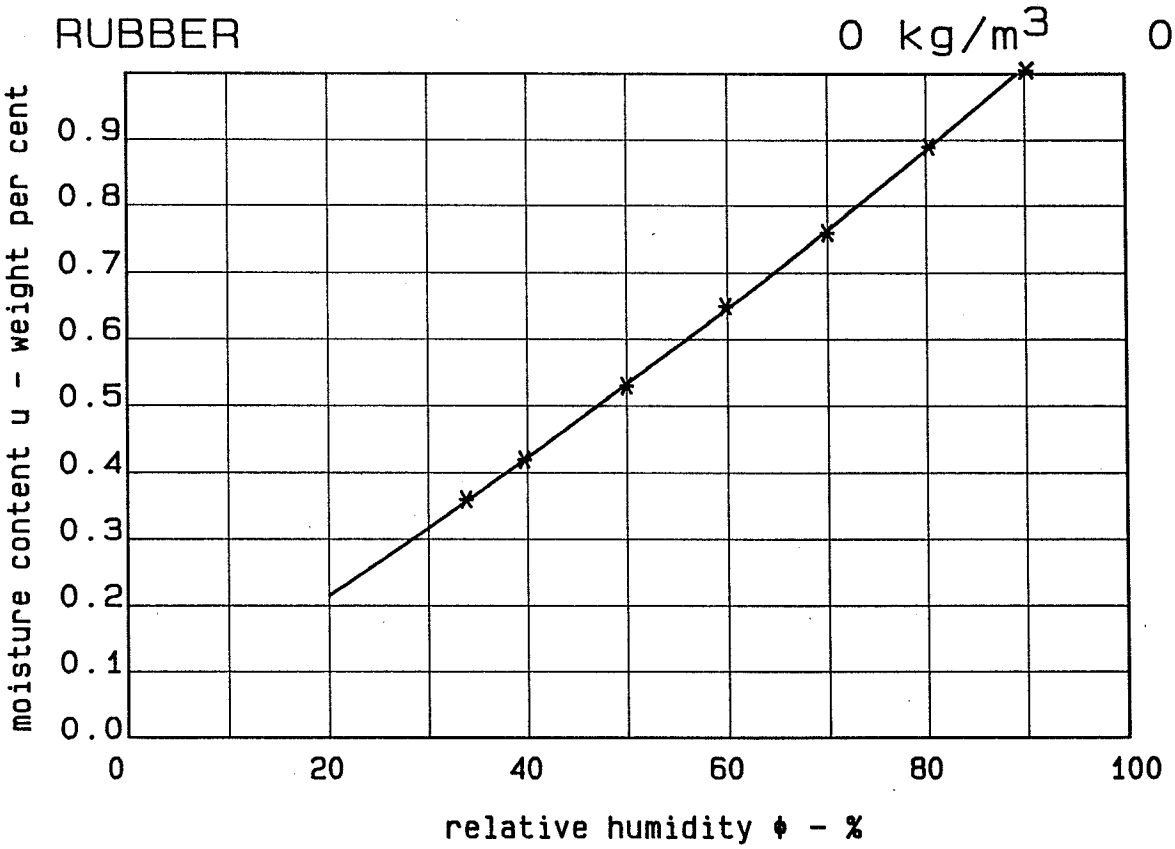
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: sodacell

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ 33.8 39.7 50.0 59.8 70.0 80.3 90.2
u 0.36 0.42 0.53 0.65 0.76 0.89 1.01

Approximation:

u= 1.14E+00*exp((-1/0.12)*ln(1-ln(ϕ)/ 7.21E+00))

No scanning values

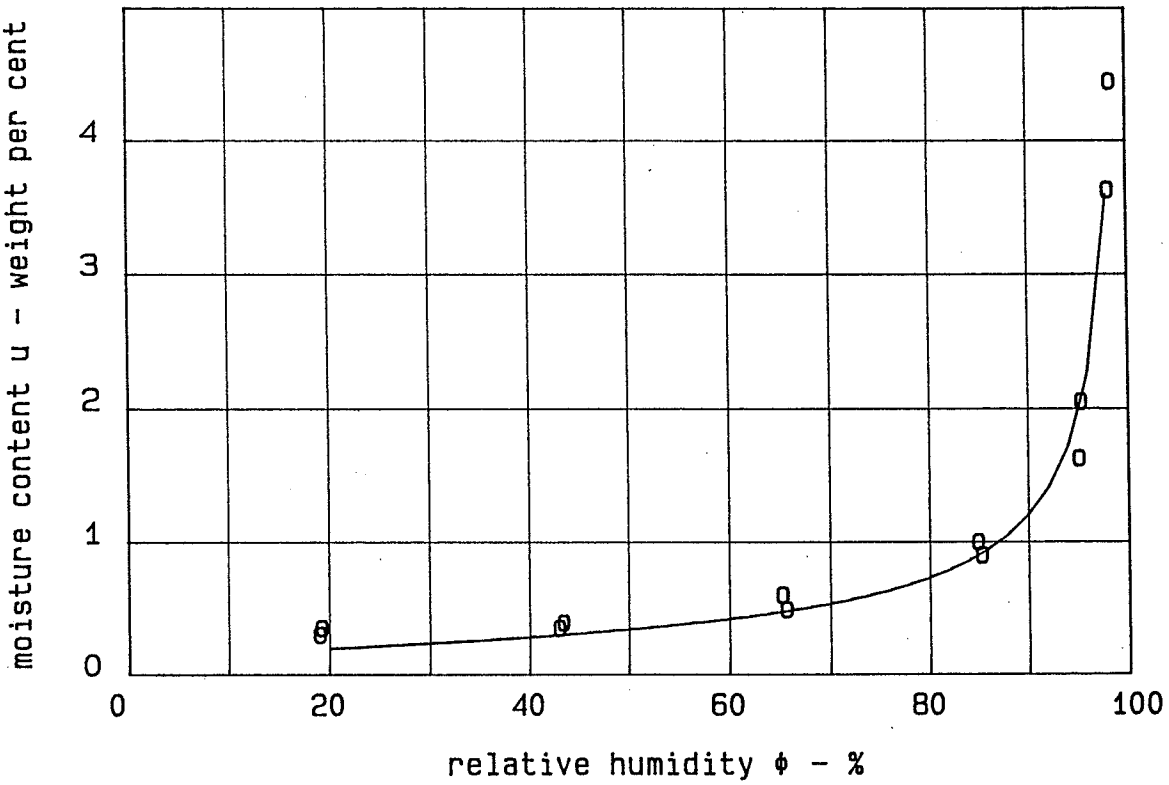
Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: rubber

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

SANDSTONE red 2700 kg/m^3 20.0°C



o measured adsorption values

ϕ	19.0	19.2	43.0	43.4	65.6	65.2	85.2	84.8	95.1	95.3	98.2	98.4
u	0.30	0.35	0.35	0.39	0.49	0.60	0.90	1.00	1.63	2.05	3.63	4.45

Approximation:

u= 2.90E+01*exp((-1/1.49)*ln(1-ln(ϕ)/ 9.42E-04))

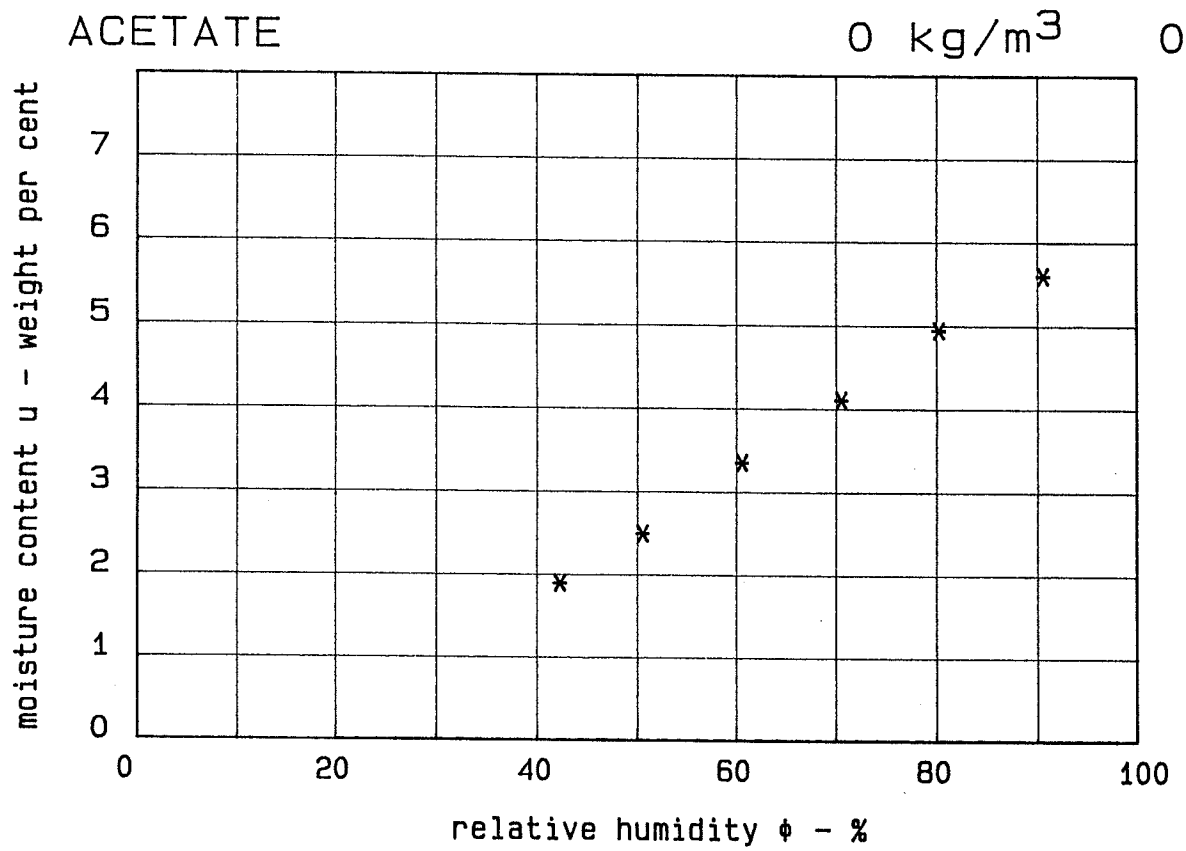
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: \m_u\sandst20.270

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ 42.2 50.6 60.6 70.5 80.3 90.6
u 1.89 2.49 3.35 4.10 4.94 5.60
Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

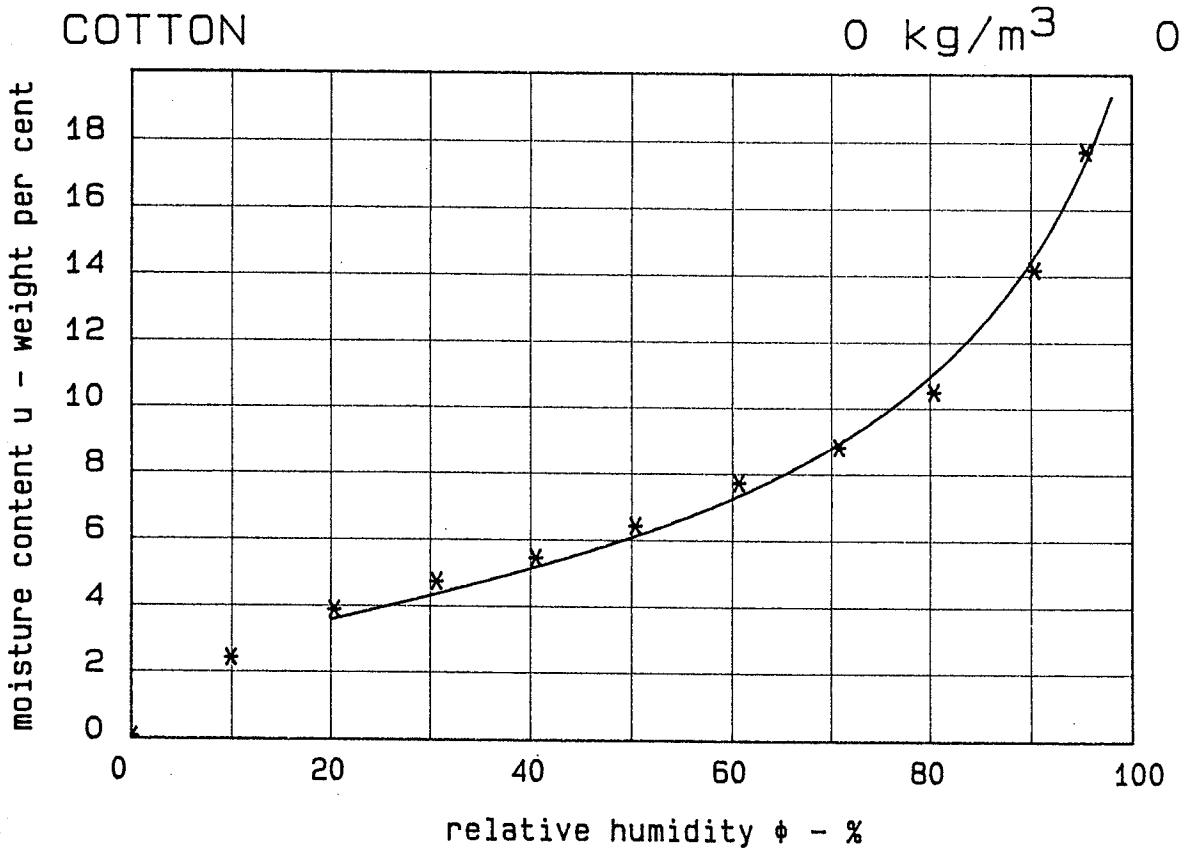
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: \A_B\ACETATE

TECHNICAL UNIVERSITY OF DENMARK, Building .Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.1	10.0	20.4	30.6	40.5	50.4	60.6	70.8	80.4	90.4	95.4
u	0.1	2.4	3.9	4.8	5.5	6.4	7.7	8.8	10.5	14.2	17.7

Approximation:

u= 2.12E+01*exp((-1/1.39)*ln(1-ln(ϕ)/ 1.49E-01))

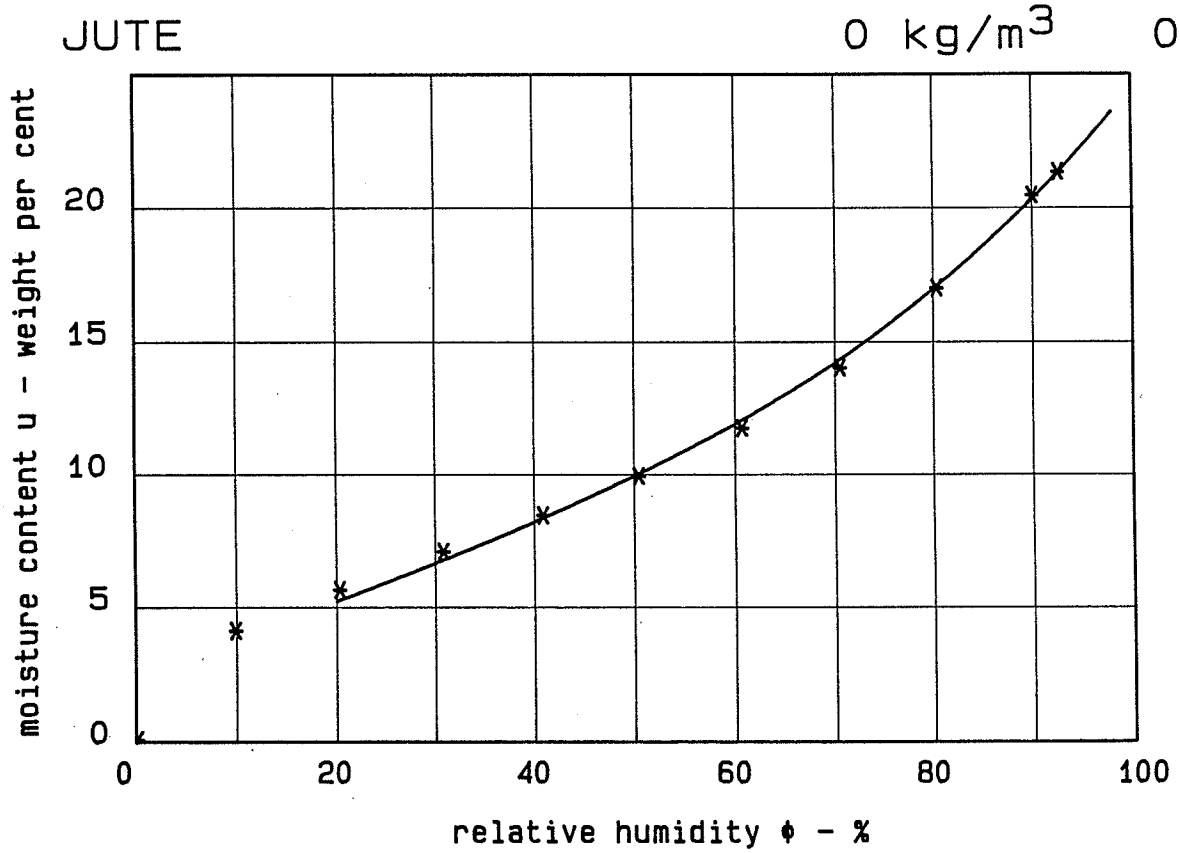
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: cotton

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.2	10.0	20.3	30.8	40.9	50.5	60.7	70.5	80.4	90.0	92.6
u	0.1	4.1	5.7	7.1	8.5	9.9	11.8	14.0	17.0	20.5	21.4

Approximation:
u= 2.45E+01*exp((-1/0.81)*ln(1-ln(ϕ)/ 6.44E-01))

No scanning values

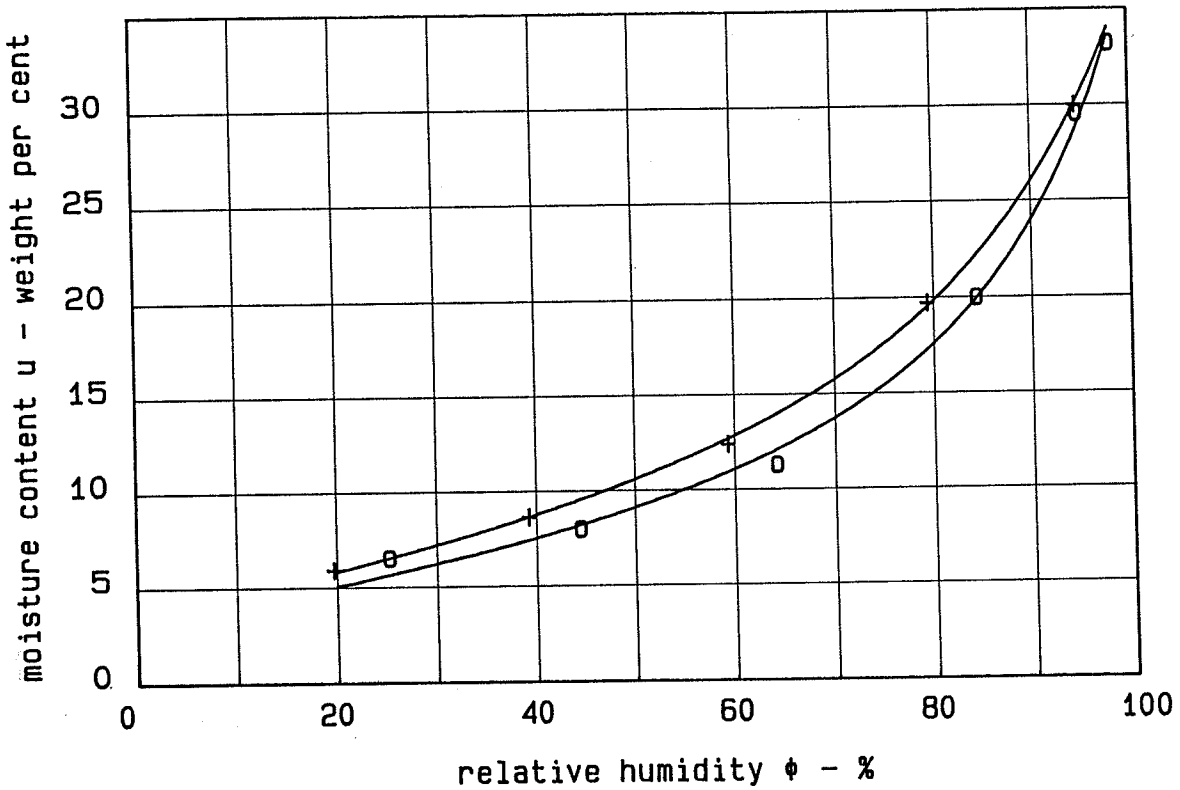
Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: jute

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

JUTE WEB 100 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	94.5	79.3	59.3	39.2	19.7
u	30.0	19.7	12.4	8.6	5.9

Approximation:
u= 3.68E+01*exp((-1/1.17)*ln(1-ln(ϕ)/ 2.11E-01))

o measured adsorption values

ϕ	25.2	44.5	64.2	84.3	94.7	98.0
u	6.5	8.0	11.3	20.0	29.5	33.2

Approximation:
u= 3.74E+01*exp((-1/1.26)*ln(1-ln(ϕ)/ 1.41E-01))

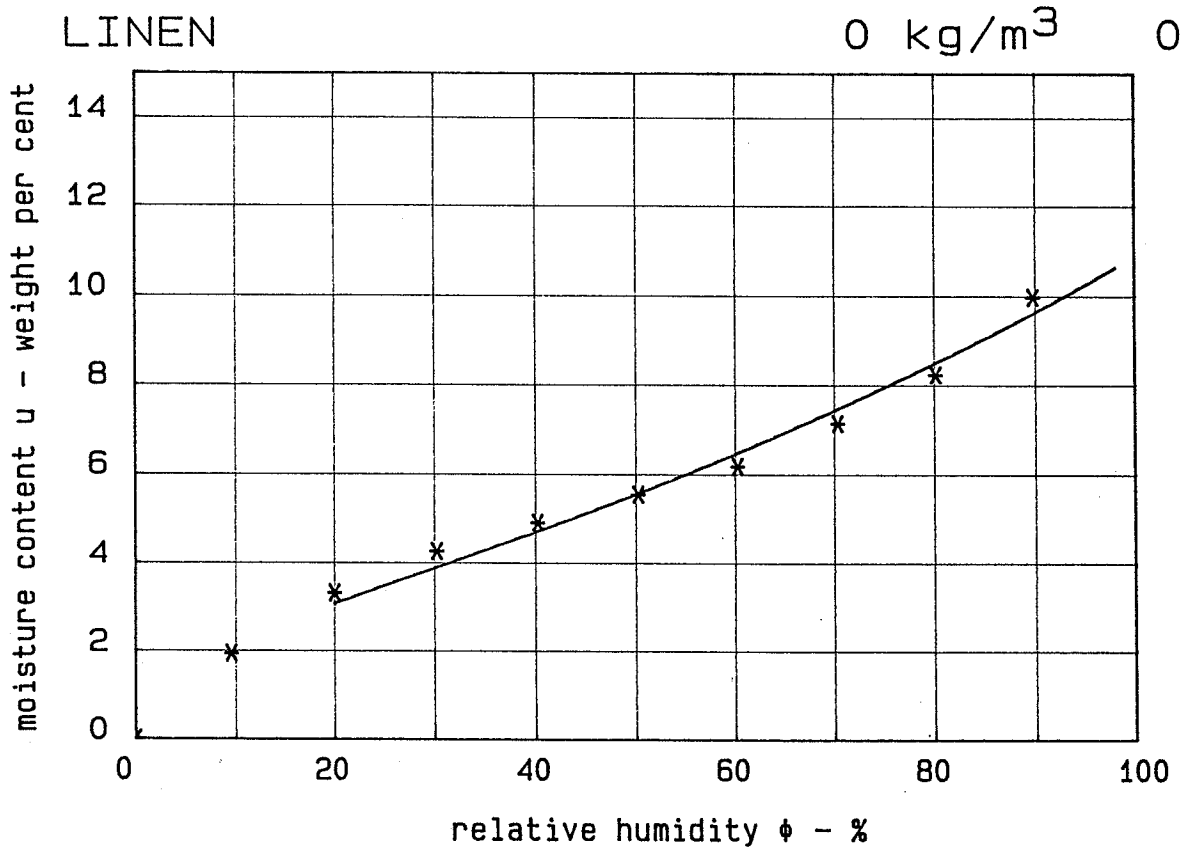
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \D_K\JUTWEB20.100

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.0	9.6	20.0	30.2	40.2	50.2	60.3	70.4	80.2	89.8
u	0.00	1.93	3.30	4.25	4.90	5.54	6.17	7.13	8.22	9.97

Approximation:

u= 1.09E+01*exp((-1/0.64)*ln(1-ln(ϕ)/ 1.28E+00))

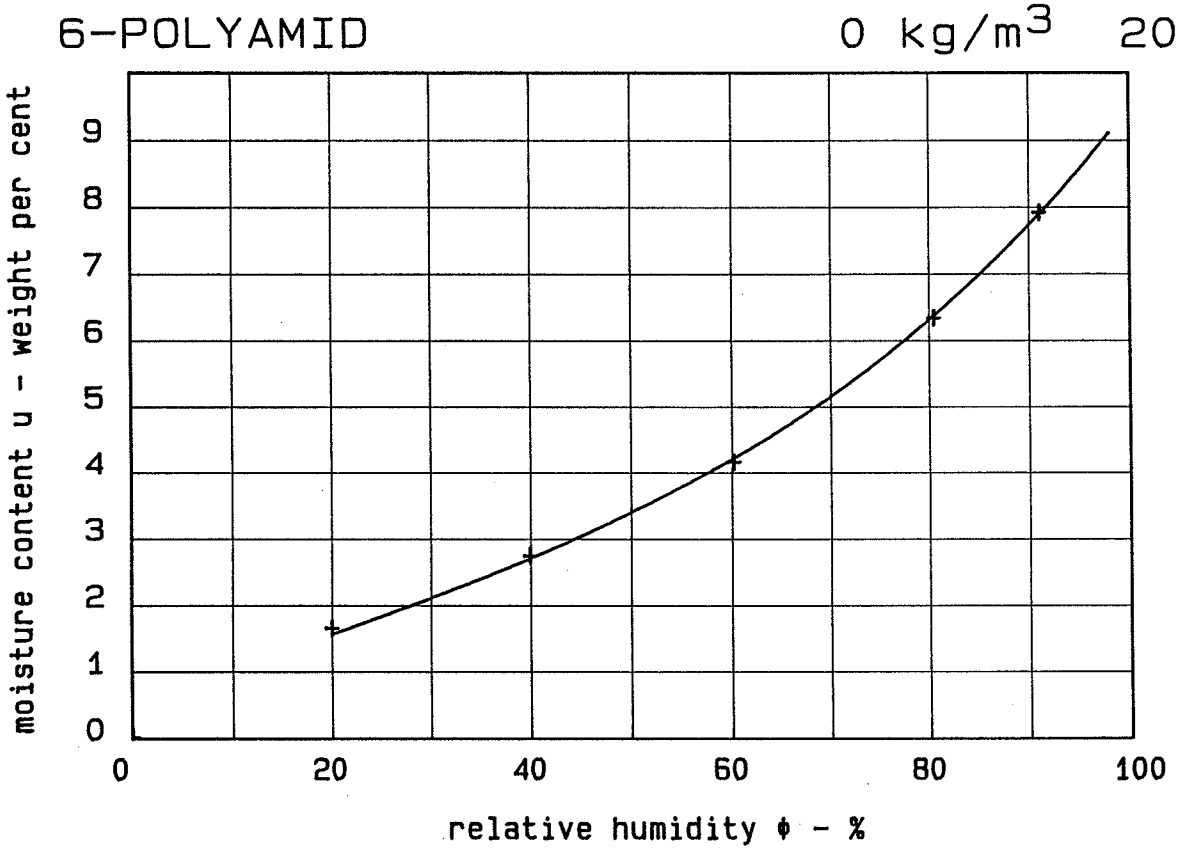
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: \L\LINEN

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	91.0	80.5	60.2	39.9	19.9	0.0
u	7.92	6.34	4.16	2.75	1.66	0.02

Approximation:

u= 9.50E+00*exp((-1/0.64)*ln(1-ln(ϕ)/ 7.51E-01))

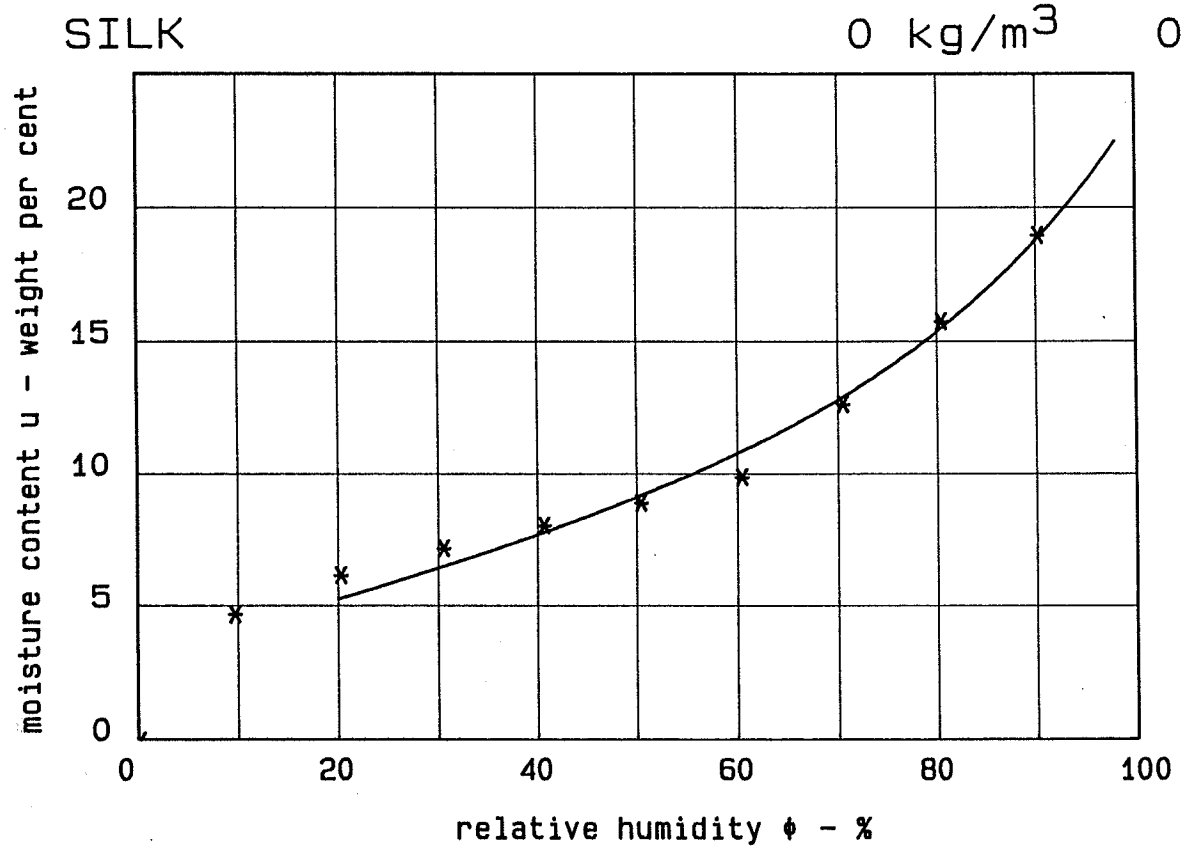
No scanning values

Notes:

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 17-10-85 Initials: KKH File: polyamid

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.2	9.8	20.3	30.5	40.7	50.5	60.5	70.5	80.5	90.2
u	-0.1	4.7	6.2	7.2	8.0	8.9	9.9	12.6	15.7	19.0

Approximation:

u= 2.36E+01*exp((-1/1.15)*ln(1-ln(ϕ)/ 3.52E-01))

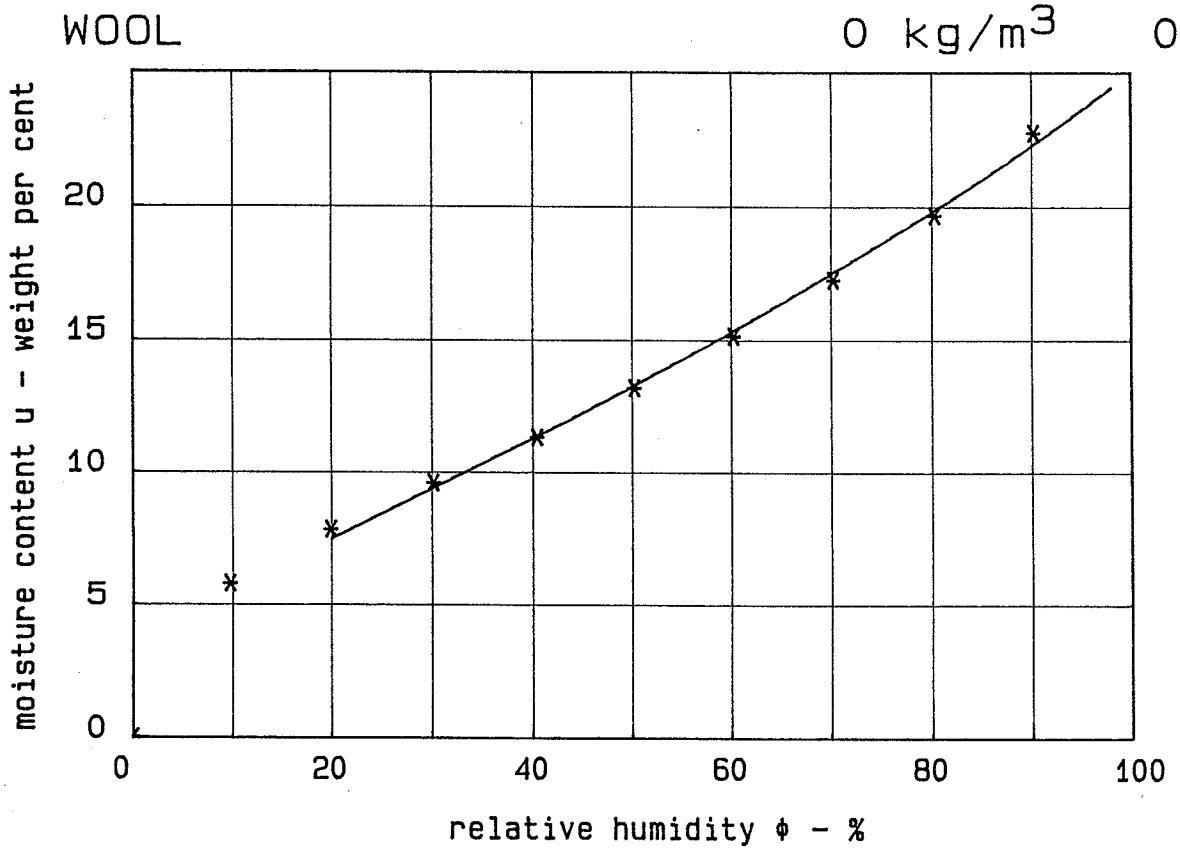
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: silk

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	0.0	9.8	19.9	30.1	40.4	50.2	60.2	70.2	80.2	90.2
u	0.0	5.8	7.8	9.6	11.3	13.2	15.1	17.2	19.6	22.8

Approximation:

u= 2.50E+01*exp((-1/0.63)*ln(1-ln(ϕ)/ 1.40E+00))

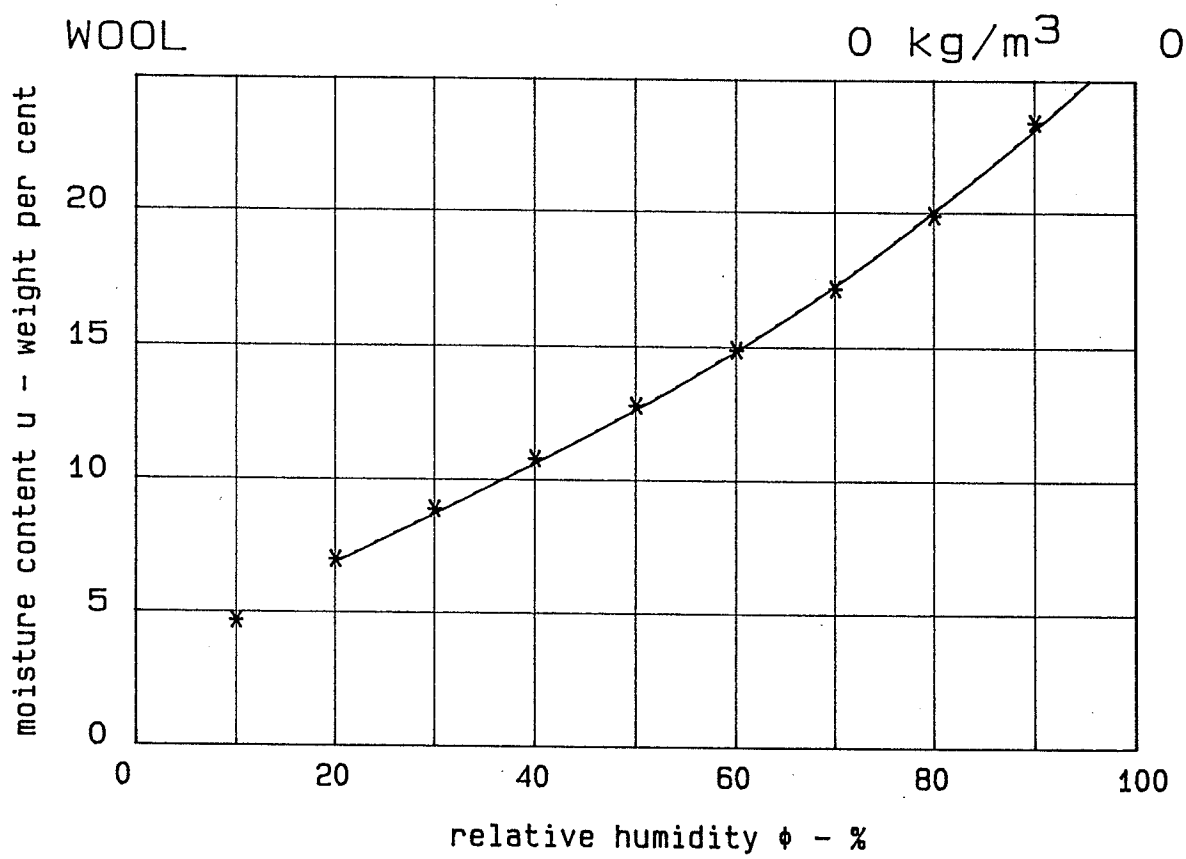
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: \V_Z\WOOL

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.0	90.0
u	4.7	7.0	8.9	10.8	12.8	14.9	17.2	19.9	23.4

Approximation:

u= 2.67E+01*exp((-1/0.72)*ln(1-ln(ϕ)/ 9.84E-01))

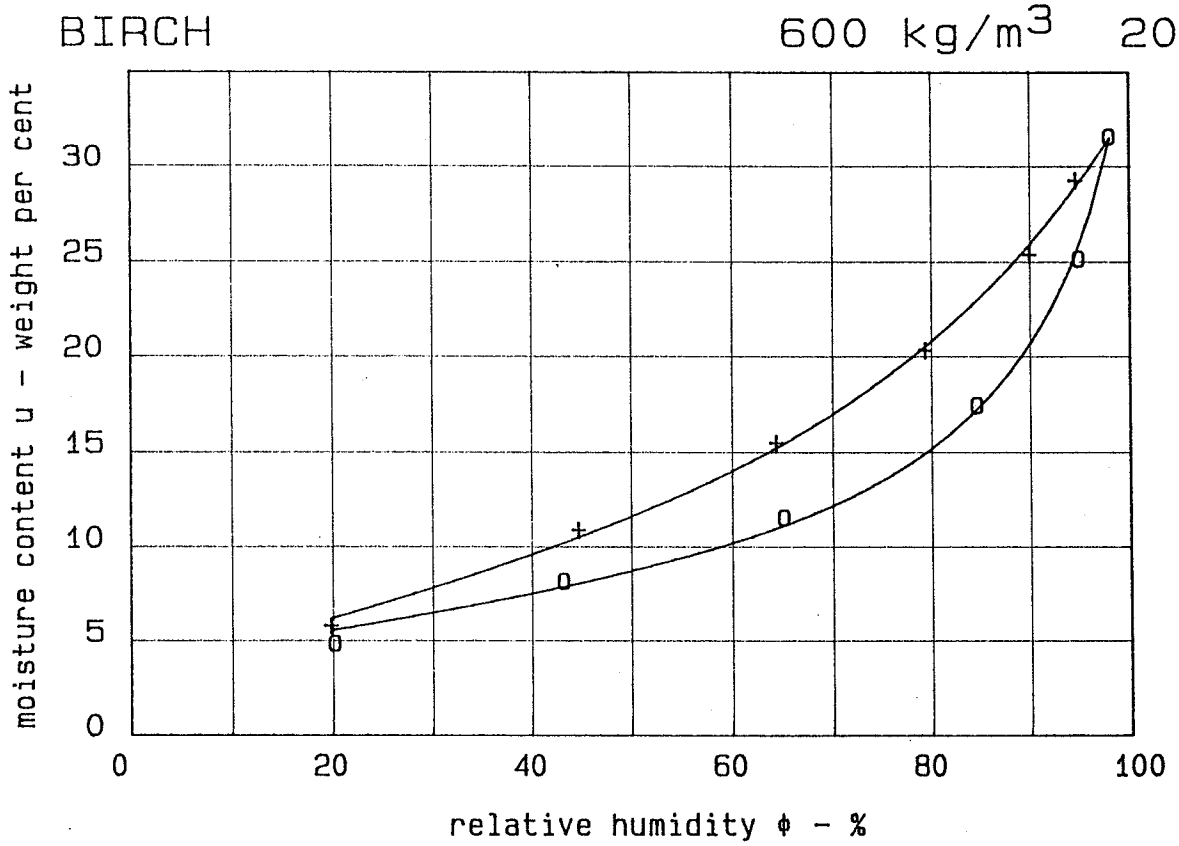
No scanning values

Notes:

Litterature: Lykow, A.W.: Transporterscheinungen in kapillarporosen korpern. Akademie-Verlag, Berlin. 1958.

Date: 17-10-85 Initials: KKH File: \V_Z\WOOLLYK

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ 94.5 89.9 79.3 64.3 44.7 19.8
u 29.3 25.4 20.3 15.5 10.9 5.8
Approximation:
u= 3.32E+01*exp((-1/0.99)*ln(1-ln(ϕ)/ 3.82E-01))

o measured adsorption values

ϕ 20.1 43.2 65.1 84.6 94.8 98.0
u 4.9 8.2 11.6 17.5 25.2 31.6
Approximation:
u= 3.72E+01*exp((-1/1.77)*ln(1-ln(ϕ)/ 5.78E-02))

No scanning values

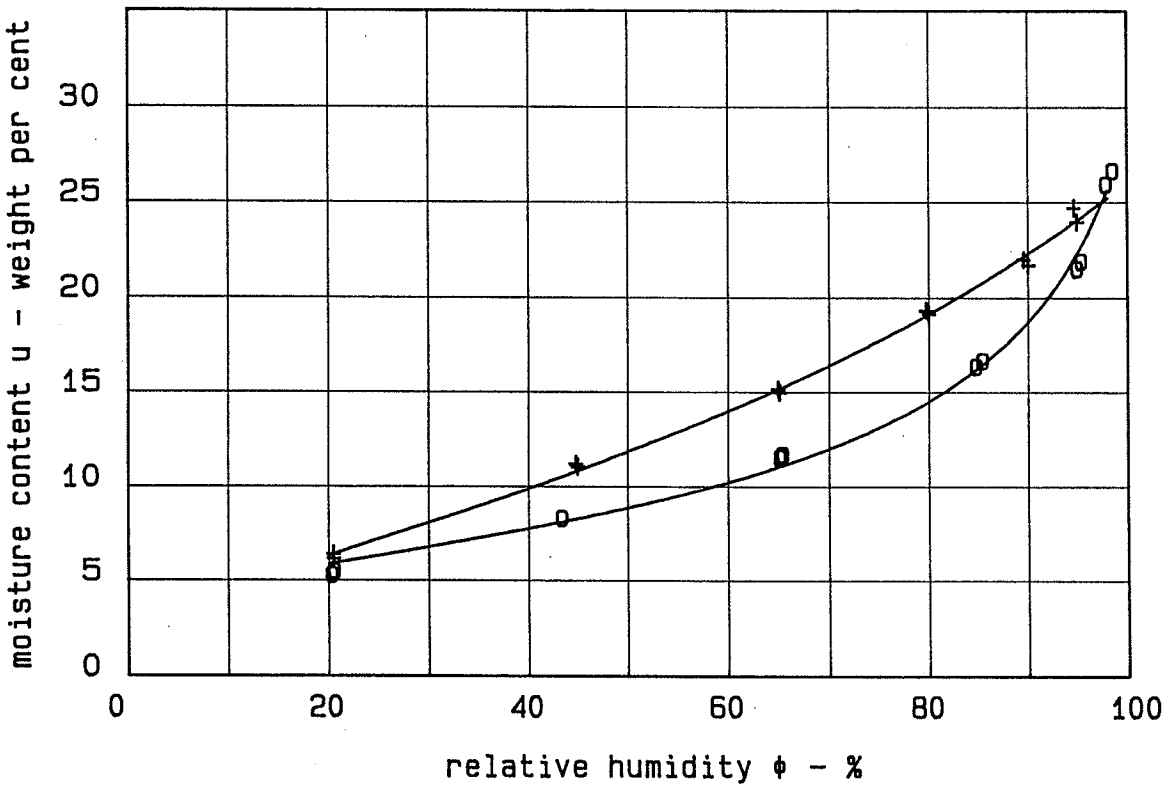
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: birch020.600

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

OAK 780 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	94.6	94.9	89.5	90.0	79.7	80.0	64.9	65.1	44.7	45.0	20.4	20.5
u	24.7	24.0	22.0	21.7	19.3	19.1	15.1	15.0	11.2	11.0	6.4	6.2

Approximation:
u= 2.60E+01*exp((-1/0.73)*ln(1-ln(ϕ)/ 8.90E-01))

o measured adsorption values

ϕ	20.3	20.5	43.3	65.1	65.4	84.7	85.4	94.9	95.3	97.9	98.6
u	5.3	5.5	8.3	11.5	11.7	16.3	16.6	21.5	21.9	25.9	26.6

Approximation:
u= 2.86E+01*exp((-1/1.88)*ln(1-ln(ϕ)/ 8.65E-02))

No scanning values

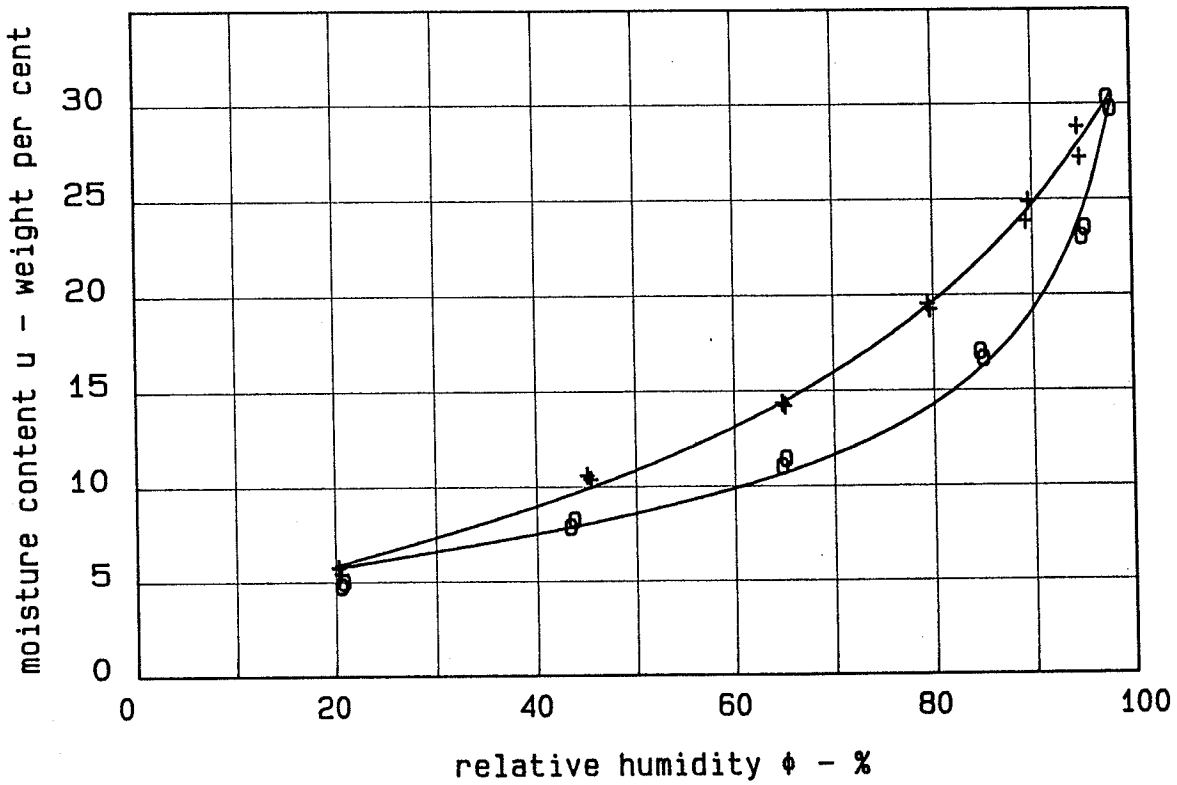
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \M_U\OAK00020.780

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

BEECH 750 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	94.6	94.9	89.6	89.3	79.4	79.7	64.8	65.0	45.1	45.4	20.3	20.6
u	28.8	27.2	24.9	23.9	19.5	19.3	14.3	14.2	10.6	10.4	5.8	5.4

Approximation:
u= 3.23E+01*exp((-1/1.03)*ln(1-ln(ϕ)/ 3.35E-01))

o measured adsorption values

ϕ	20.6	20.8	43.4	43.8	64.8	65.1	85.0	84.7	95.0	95.3	98.0	97.7
u	4.8	5.0	7.9	8.2	11.0	11.5	16.7	17.0	23.0	23.5	29.7	30.3

Approximation:
u= 3.69E+01*exp((-1/2.02)*ln(1-ln(ϕ)/ 3.87E-02))

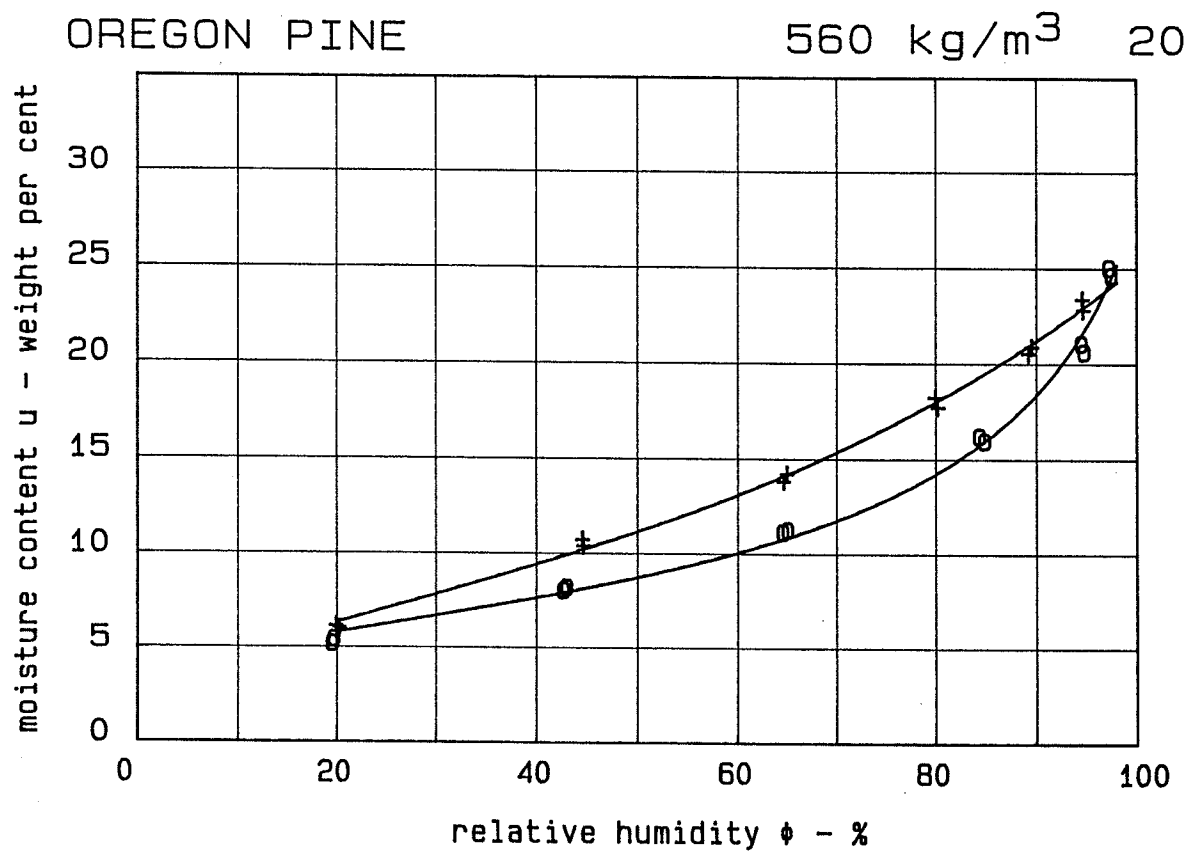
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 8-10-85 Initials: KKH File: A_B\BEECH020.750

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	94.5	94.7	89.5	89.2	79.9	80.2	64.9	64.6	44.5	44.6	19.9	20.3
u	23.4	22.8	20.9	20.5	18.2	17.7	14.2	13.8	10.7	10.4	6.2	6.1

Approximation:
u= 2.52E+01*exp((-1/0.94)*ln(1-ln(ϕ)/ 6.01E-01))

o measured adsorption values

ϕ	19.5	19.7	42.7	43.0	64.5	65.0	84.9	84.3	94.7	94.5	97.4	97.2
u	5.2	5.5	8.0	8.2	11.1	11.3	16.0	16.2	20.6	21.1	24.6	25.0

Approximation:
u= 2.82E+01*exp((-1/1.90)*ln(1-ln(ϕ)/ 8.43E-02))

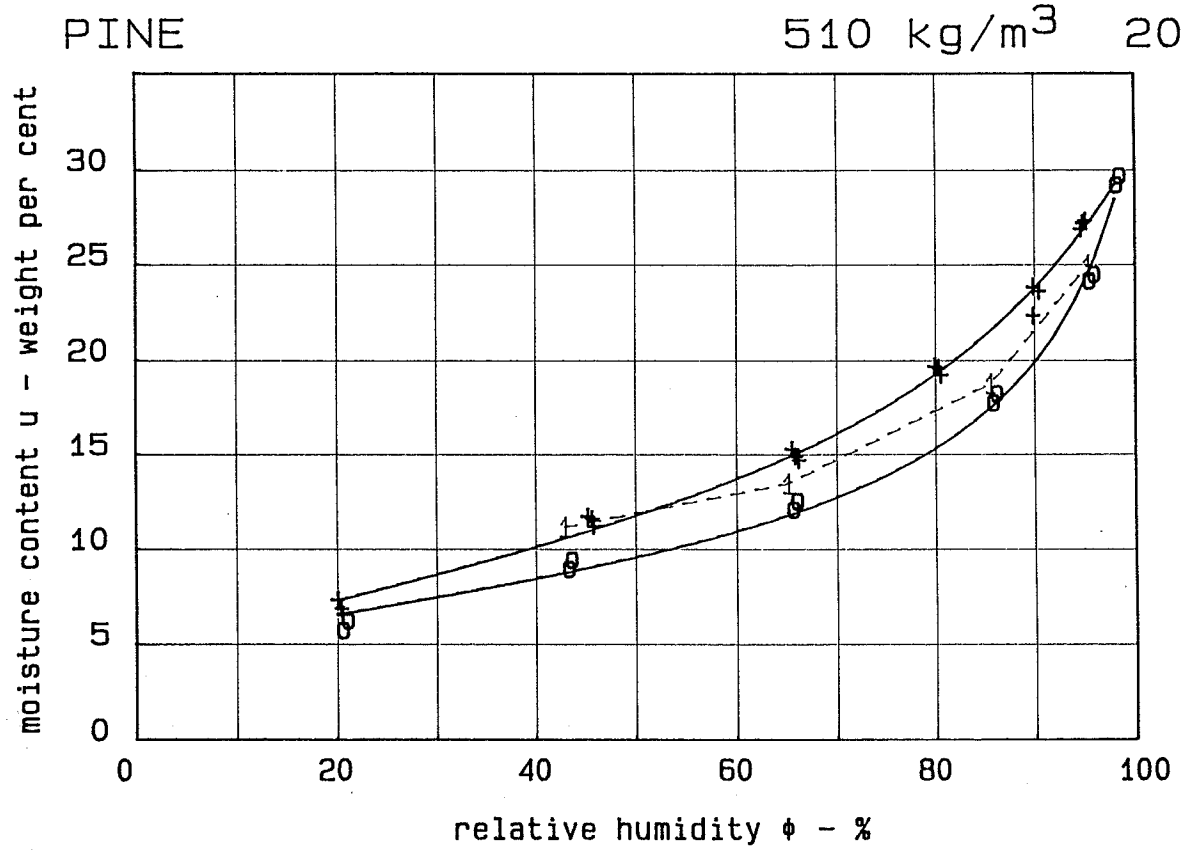
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \M_U\OREPIN20.560

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ 95.0 94.8 94.6 89.8 90.4 89.8 79.8 80.3 80.5 65.4 65.8 66.1 45.1 45.6 45.8 1
u 27.3 27.1 26.8 23.8 23.6 22.3 19.7 19.6 19.2 15.2 14.9 14.7 11.7 11.6 11.2
Approximation:
u= 3.10E+01*exp((-1/1.45)*ln(1-ln(ϕ)/ 2.25E-01))

o measured adsorption values

ϕ 20.5 21.0 43.3 43.5 65.6 66.0 85.8 86.2 95.4 95.9 98.2 98.5
u 5.7 6.2 8.9 9.4 12.0 12.5 17.7 18.2 24.1 24.4 29.2 29.6
Approximation:
u= 3.29E+01*exp((-1/2.09)*ln(1-ln(ϕ)/ 5.67E-02))

1 measured scanning values

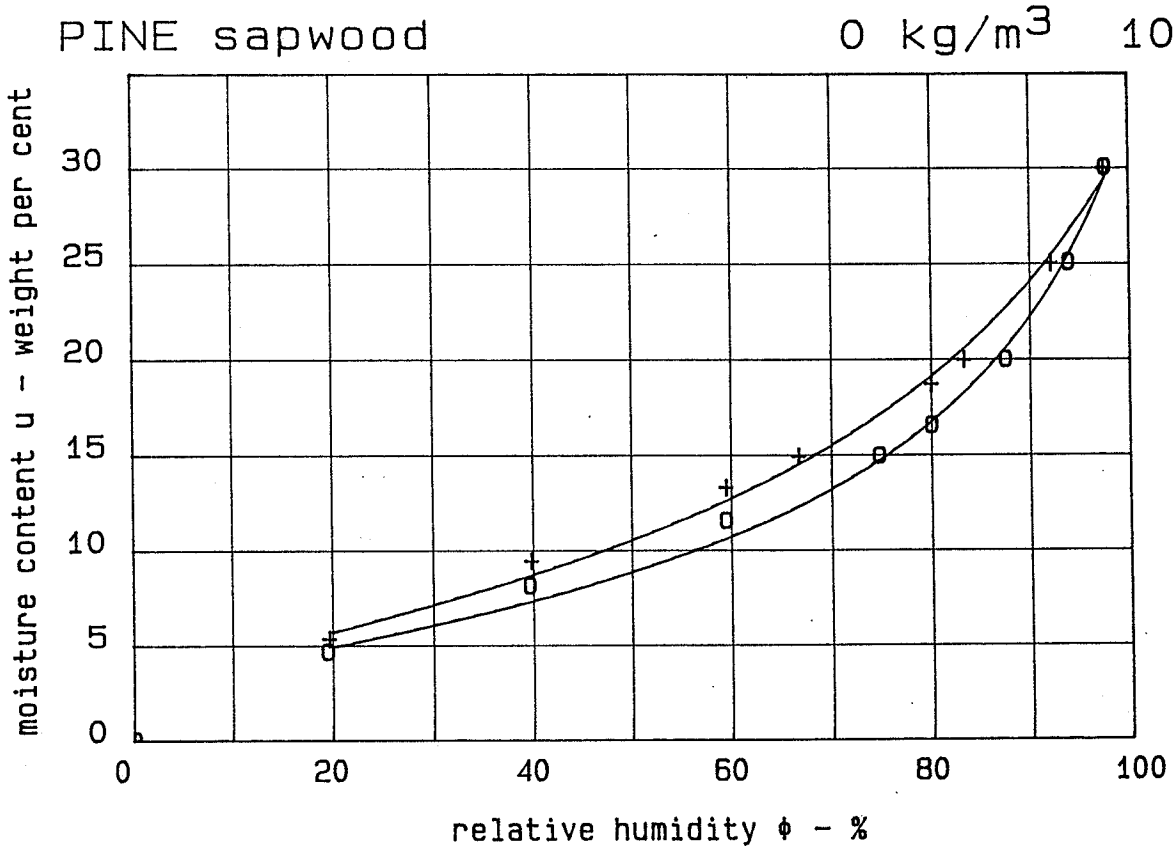
ϕ 42.9 65.1 85.6 95.3
u 11.2 13.5 18.8 25.0

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 3-10-85 Initials: KKH File: \M_U\PINE20.510

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	97.5	92.0	83.3	79.9	66.7	59.4	39.7	19.6	0.0
u	30.0	25.0	20.0	18.7	14.9	13.3	9.4	5.3	0.0

Approximation:
u= 3.16E+01*exp((-1/1.04)*ln(1-ln(ϕ)/ 3.26E-01))

o measured adsorption values

ϕ	0.2	19.5	39.6	59.4	74.7	80.0	87.5	93.9	97.6
u	0.0	4.7	8.1	11.6	15.0	16.5	20.0	25.1	30.1

Approximation:
u= 3.27E+01*exp((-1/1.22)*ln(1-ln(ϕ)/ 1.77E-01))

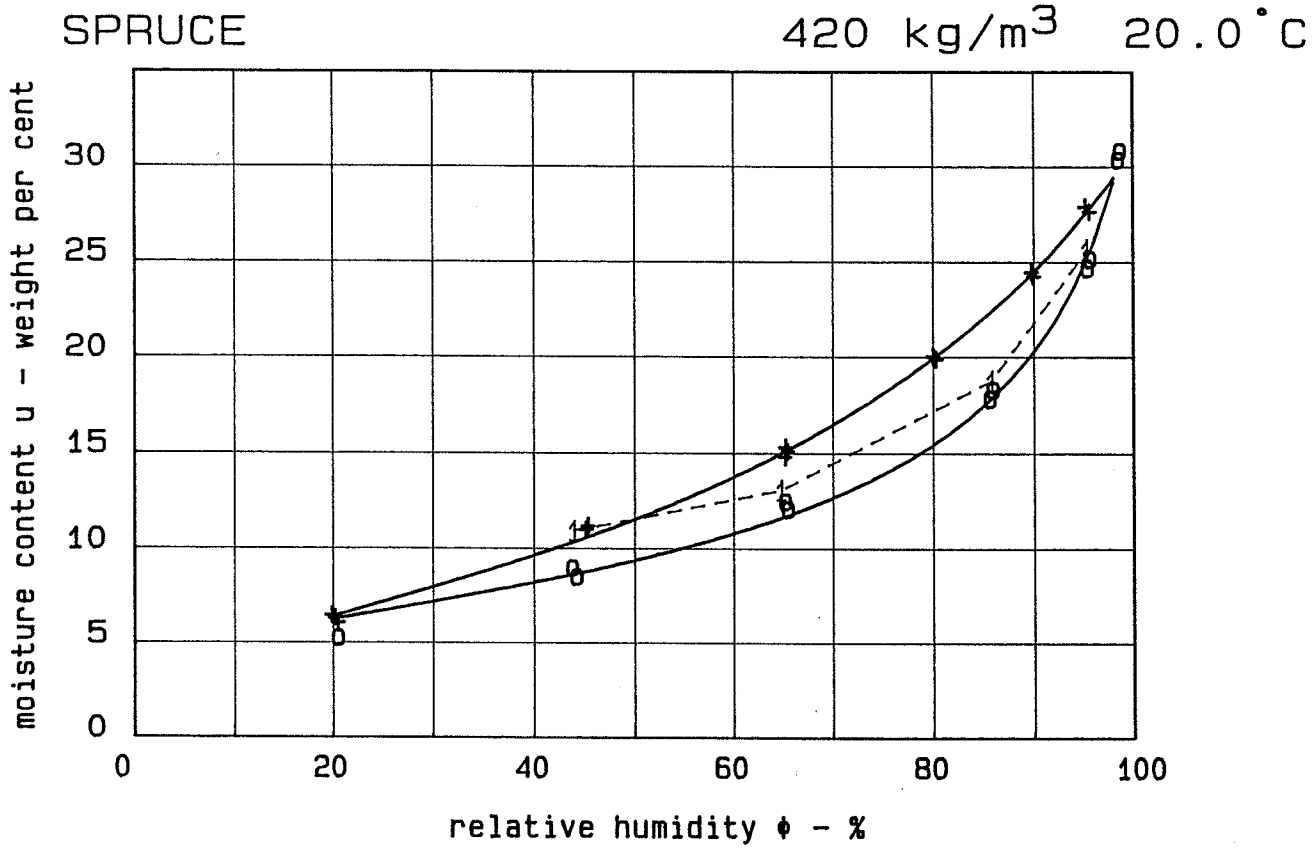
No scanning values

Notes: Density not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin Gottingen. Heidelberg. 1963.

Date: 15-10-85 Initials: KKH File: \M_U\PINE10

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ 95.1 95.6 89.8 90.0 80.0 80.3 65.2 65.4 65.1 45.3 45.1 19.9 20.2 20.5
u 27.9 27.6 24.5 24.3 20.0 19.9 15.3 15.1 14.8 11.2 11.0 6.5 6.3 6.1
Approximation:
u= 3.09E+01*exp((-1/1.05)*ln(1-ln(ϕ)/ 3.83E-01))

o measured adsorption values

ϕ 20.5 44.2 43.8 65.5 65.2 85.7 86.0 95.4 95.6 98.5 98.7
u 5.3 8.5 9.0 12.1 12.5 17.8 18.3 24.7 25.2 30.4 30.8
Approximation:
u= 3.37E+01*exp((-1/1.95)*ln(1-ln(ϕ)/ 6.26E-02))

1 measured scanning values

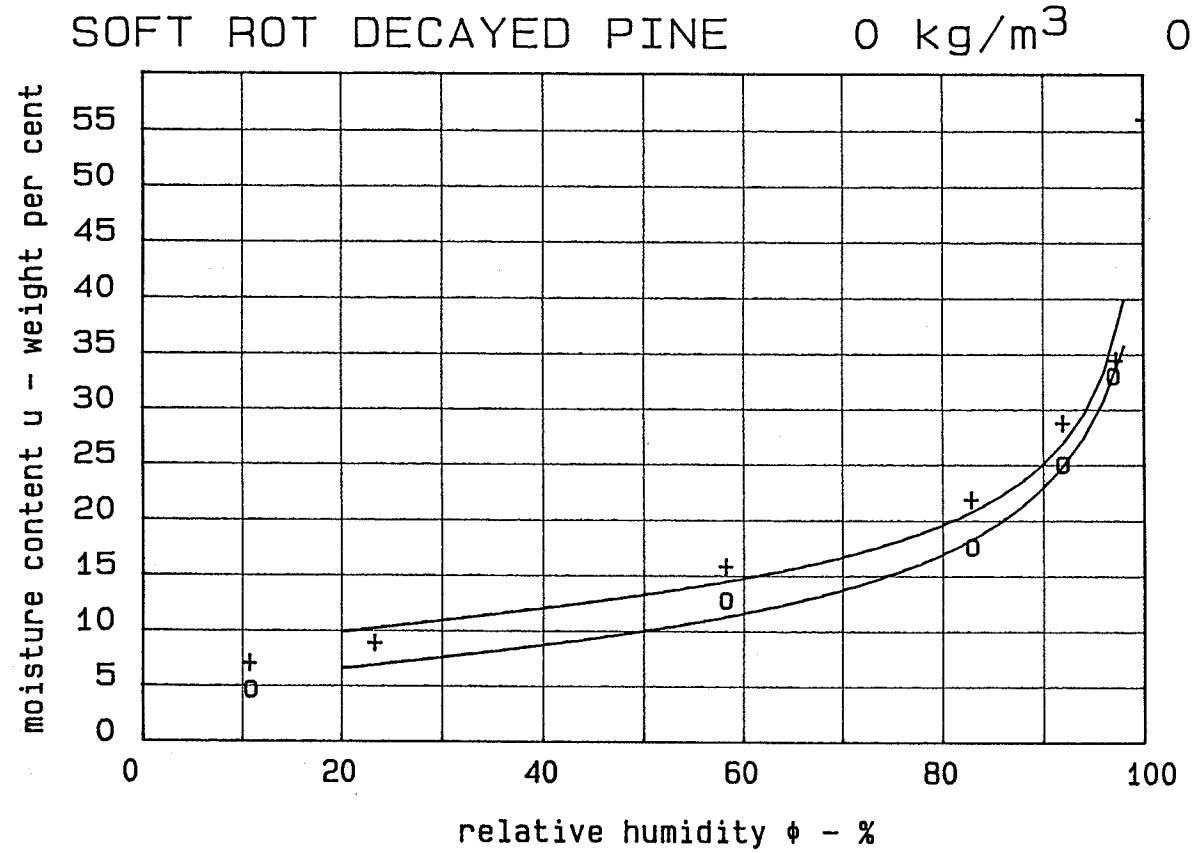
ϕ 43.9 64.8 85.8 95.3
u 10.9 13.1 18.8 25.6

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 8-10-85 Initials: KKH File: \M_U\SPRUCE20.420

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ 99.9 97.2 91.8 82.7 58.1 23.2 10.7
u 56.1 34.4 28.7 21.8 15.8 8.8 7.0
Approximation:
u= 5.68E+01*exp((-1/2.81)*ln(1-ln(ϕ)/ 1.19E-02))

o measured adsorption values

ϕ 10.8 58.2 82.9 91.9 96.9
u 4.6 12.7 17.6 25.0 33.0
Approximation:
u= 4.34E+01*exp((-1/1.91)*ln(1-ln(ϕ)/ 4.48E-02))

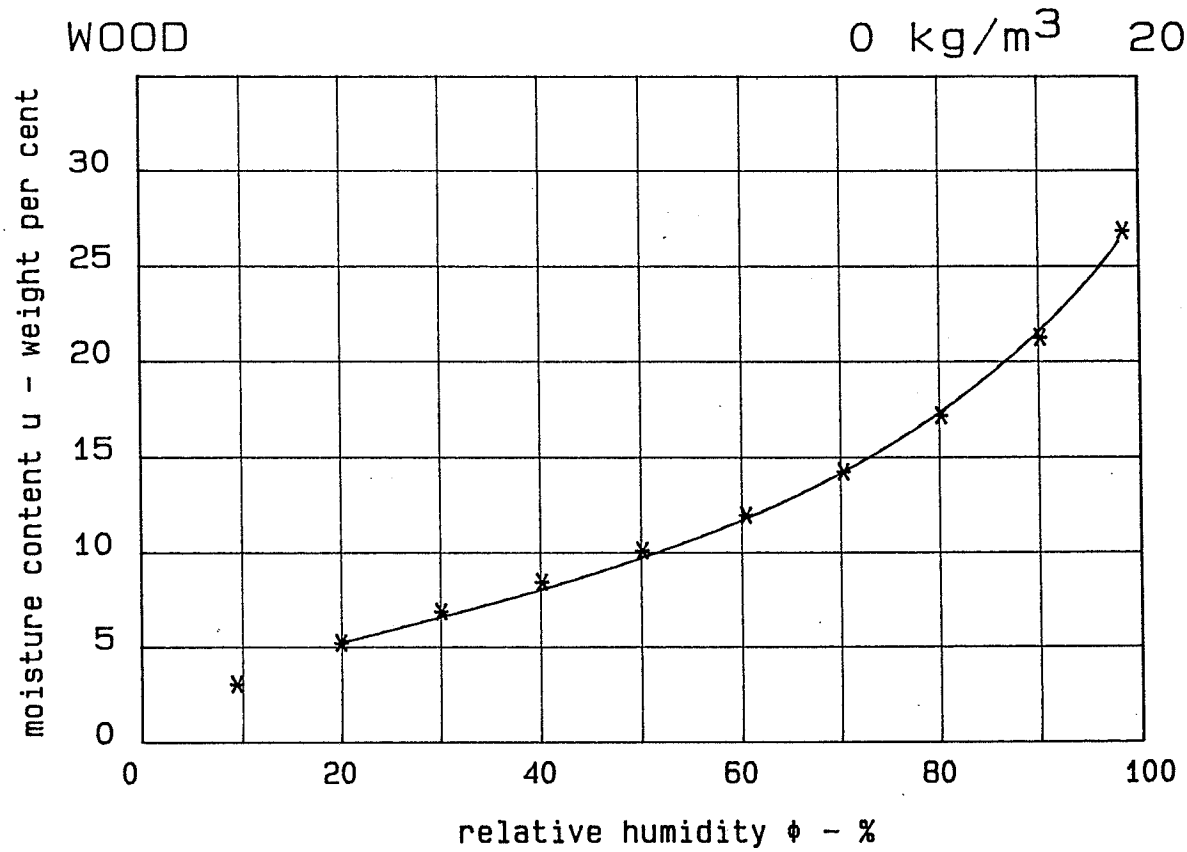
No scanning values

Notes:

Litterature: Hoffmeyer, Preben: Mechanical properties of soft rotdecayed Scots Pine with special reference to wooden poles. Swedish Wood Pres. Inst., 117, 1975.

Date: 24- 3-86 Initials: KKH File: \M_U\SOFTROTW

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



* measured sorption values

ϕ	9.4	19.9	30.0	40.1	50.1	60.4	70.2	80.1	90.1	98.4
u	3.1	5.2	6.9	8.5	10.1	12.0	14.3	17.2	21.3	26.8

Approximation:

u= 2.77E+01*exp((-1/1.01)*ln(1-ln(ϕ)/ 3.71E-01))

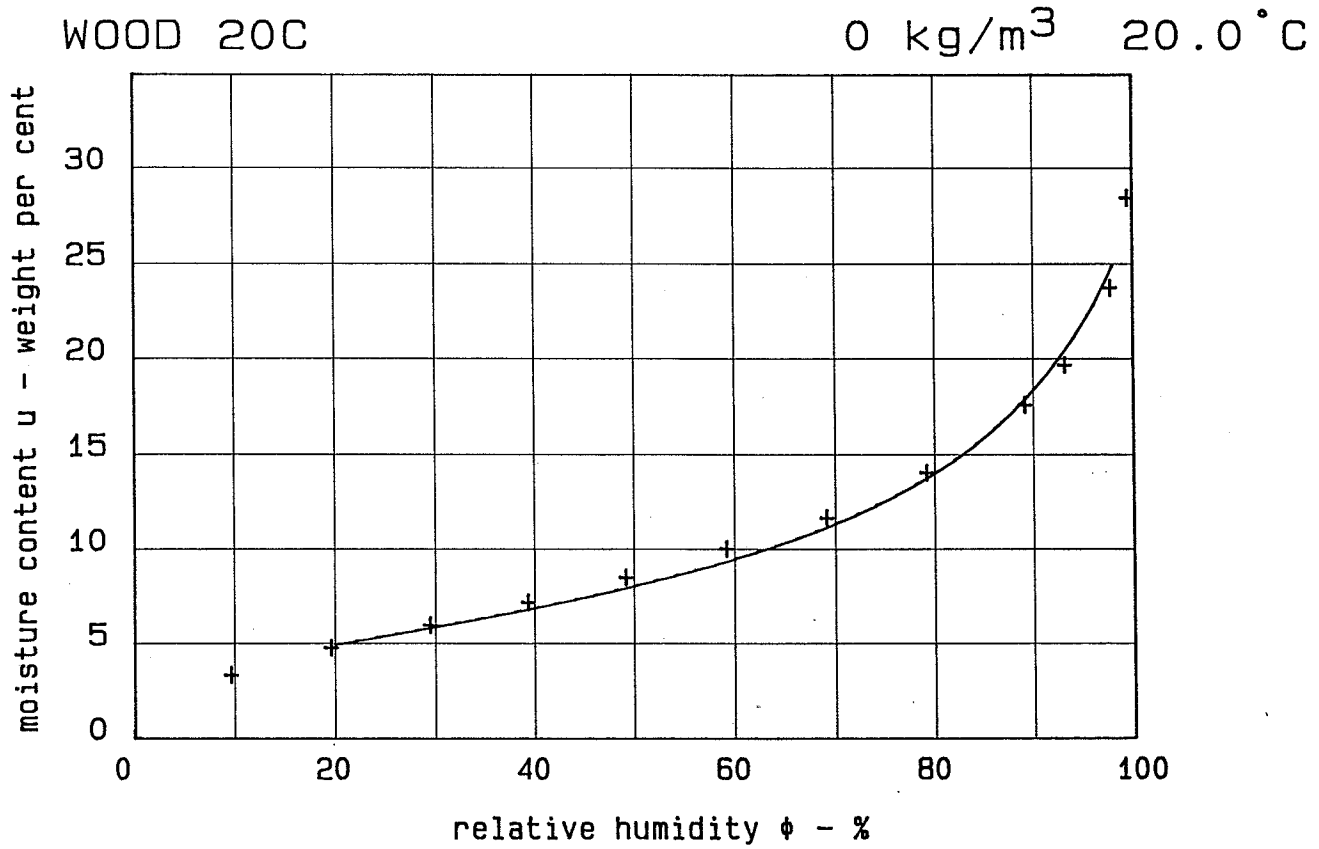
No scanning values

Notes: T.I. official curve.
Density not indicated.

Litterature: Technological Institute, Denmark.

Date: 24- 3-86 Initials: KKH File: \v_z\wood20

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	99.5	97.7	93.1	89.1	79.1	69.1	59.1	49.1	39.2	29.4	19.5	9.6	0.0
u	28.4	23.8	19.7	17.6	14.1	11.7	10.1	8.5	7.2	6.0	4.8	3.4	0.0

Approximation:

u= 2.75E+01*exp((-1/1.56)*ln(1-ln(ϕ)/ 1.21E-01))

No scanning values

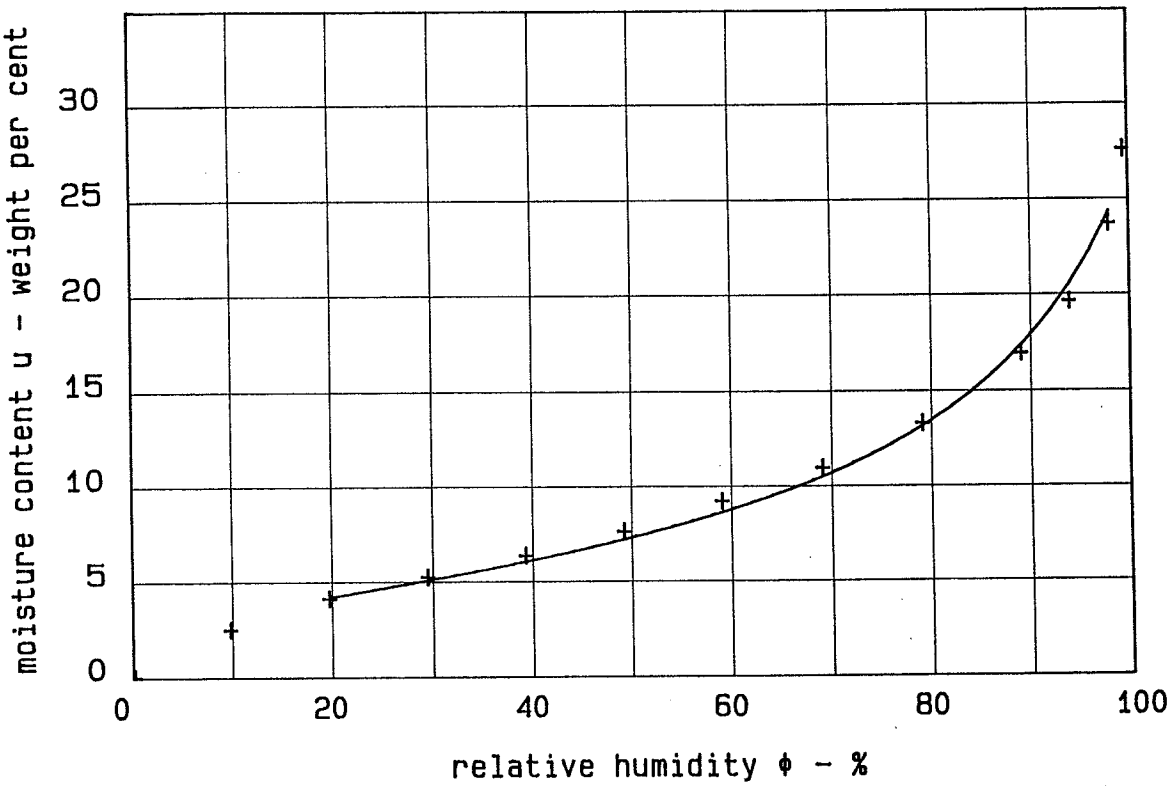
Notes: Density not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 15-10-85 Initials: KKH File: \v_z\woodsa20

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

WOOD 40C 0 kg/m^3 40.0°C



\+ measured desorption values

ϕ	99.5	97.9	93.9	89.0	79.1	69.0	59.0	49.2	39.2	29.5	19.7	9.8	0.2
u	27.6	23.7	19.7	17.0	13.3	11.0	9.2	7.7	6.4	5.3	4.2	2.5	0.0

Approximation:

u= 2.68E+01*exp((-1/1.35)*ln(1-ln(ϕ)/ 1.47E-01))

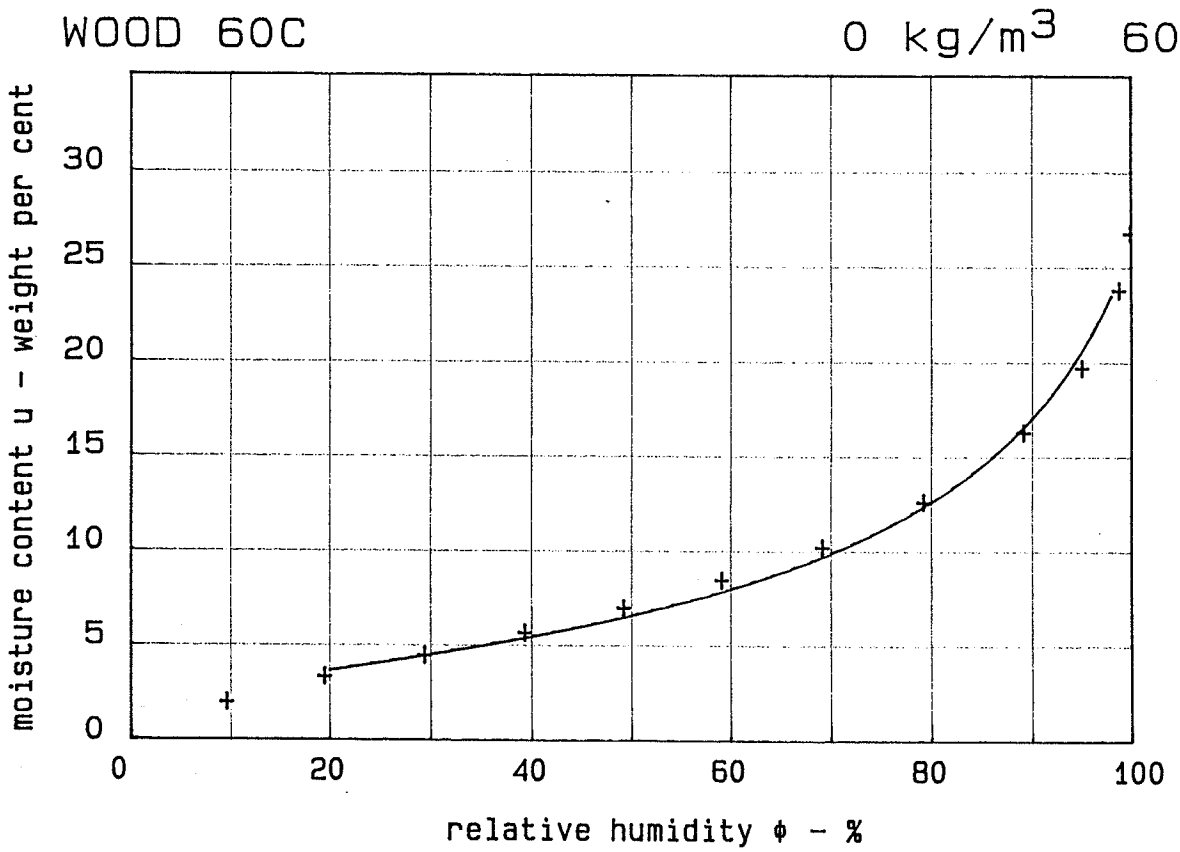
No scanning values

Notes: Density not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \v_z\woodsa40

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	99.9	98.7	95.0	89.1	79.2	69.1	59.0	49.1	39.3	29.3	19.4	9.6	0.0
u	26.7	23.7	19.7	16.2	12.6	10.1	8.4	6.9	5.6	4.4	3.3	2.0	0.0

Approximation:

u= 2.59E+01*exp((-1/1.24)*ln(1-ln(ϕ)/ 1.54E-01))

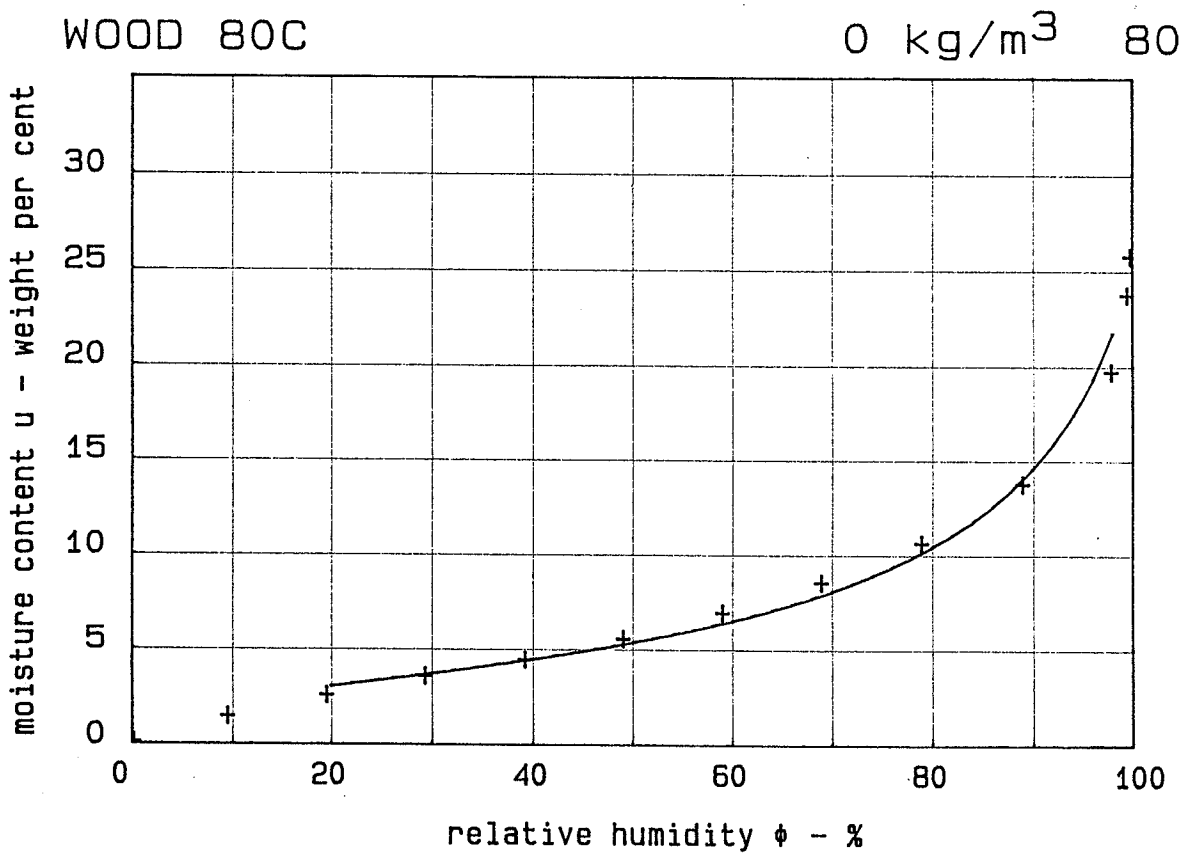
No scanning values

Notes: Density not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \V_Z\WOODSA60

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	99.7	99.4	97.8	88.9	78.9	68.9	59.0	49.0	39.2	29.3	19.5	9.6	0.1
u	25.7	23.7	19.7	13.7	10.6	8.5	6.9	5.5	4.4	3.6	2.6	1.4	0.1

Approximation:

u= 2.49E+01*exp((-1/1.35)*ln(1-ln(ϕ)/ 9.94E-02))

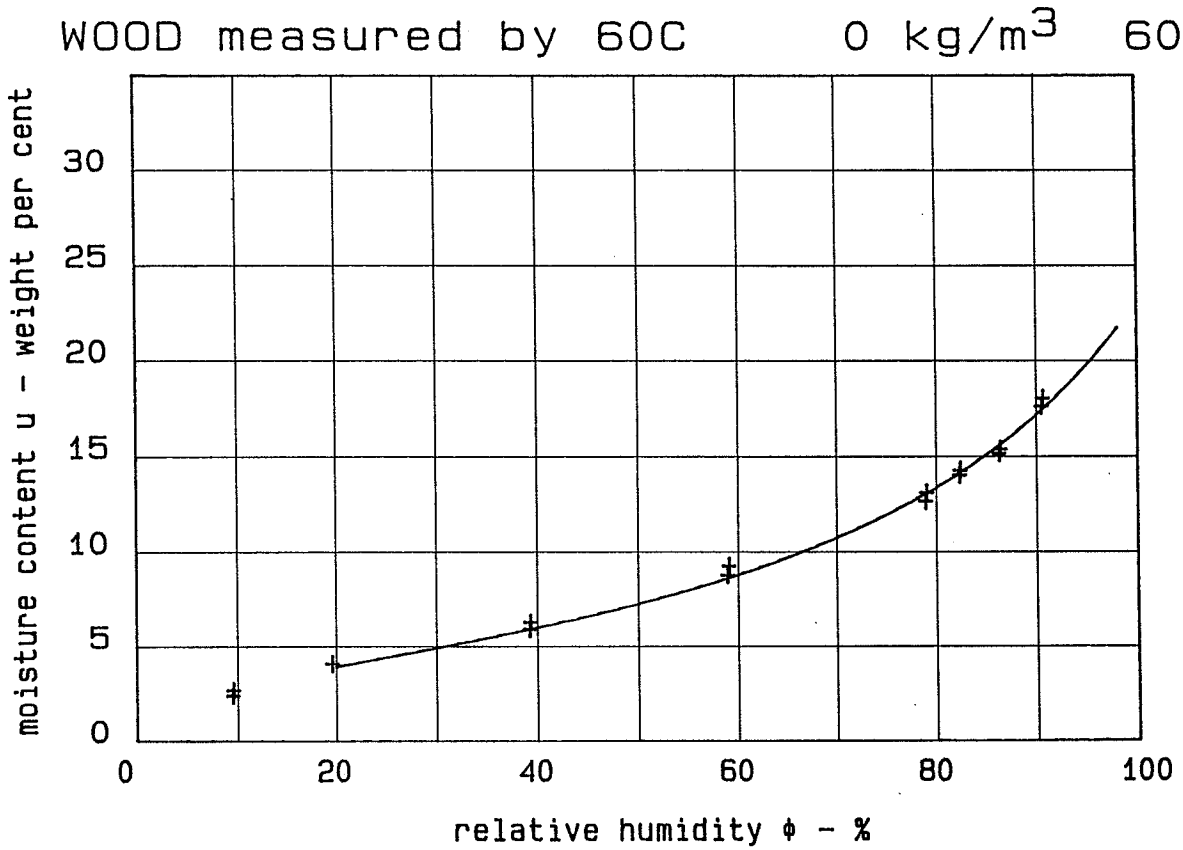
No scanning values

Notes: Density not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \V_Z\WOODSA80

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	90.6	90.4	86.3	86.2	82.3	82.3	79.0	78.9	59.0	58.9	39.2	39.2	19.5	9.6	9.5
u	18.0	17.6	15.4	15.1	14.3	14.0	13.1	12.7	9.3	8.8	6.3	5.9	4.1	2.7	2.4

Approximation:

$u = 2.32E+01 * \exp((-1/1.10) * \ln(1-\ln(\phi)/2.71E-01))$

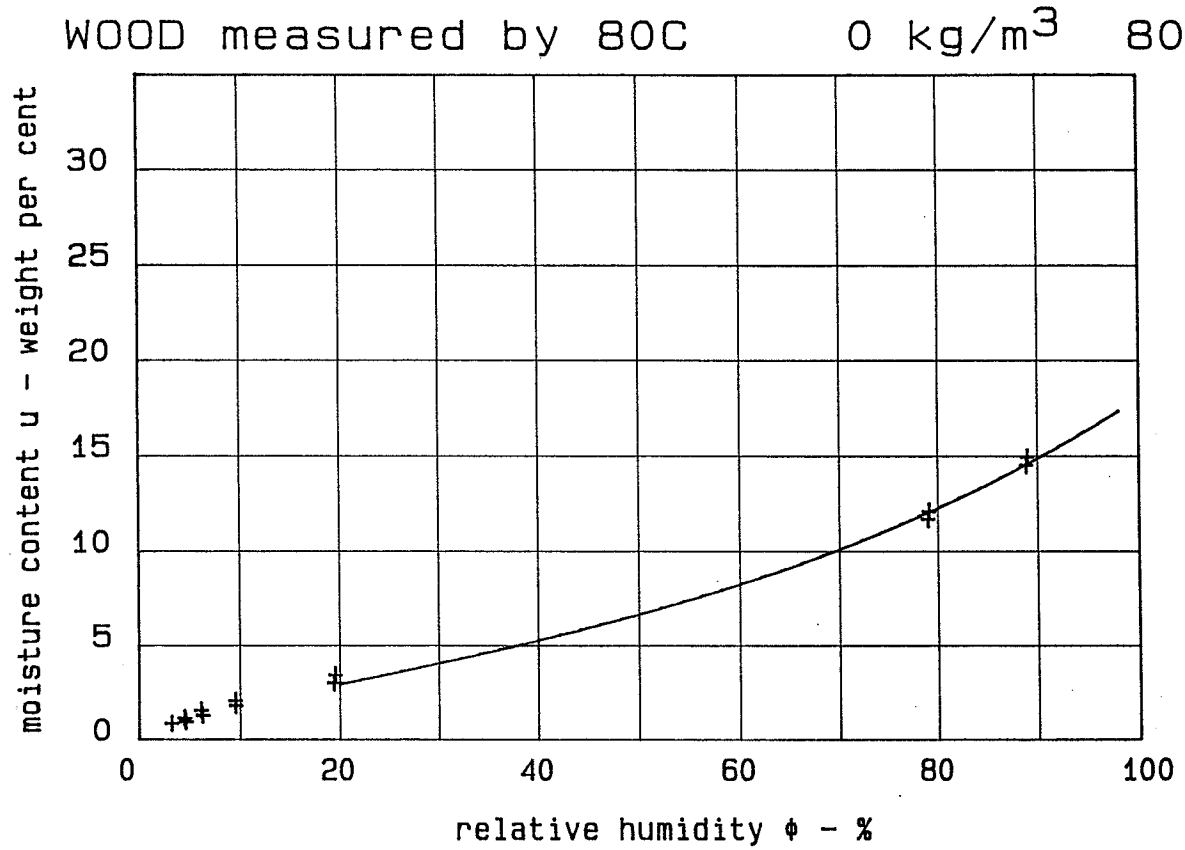
No scanning values

Notes: Density not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \v_z\woodme60

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ	88.9	88.8	79.0	78.9	19.5	19.3	9.5	9.6	6.1	6.3	4.5	4.7	3.2
u	14.9	14.5	12.1	11.7	3.4	3.0	2.1	1.8	1.6	1.3	1.1	0.9	0.9

Approximation:

u= 1.80E+01*exp((-1/0.54)*ln(1-ln(ϕ)/ 9.88E-01))

No scanning values

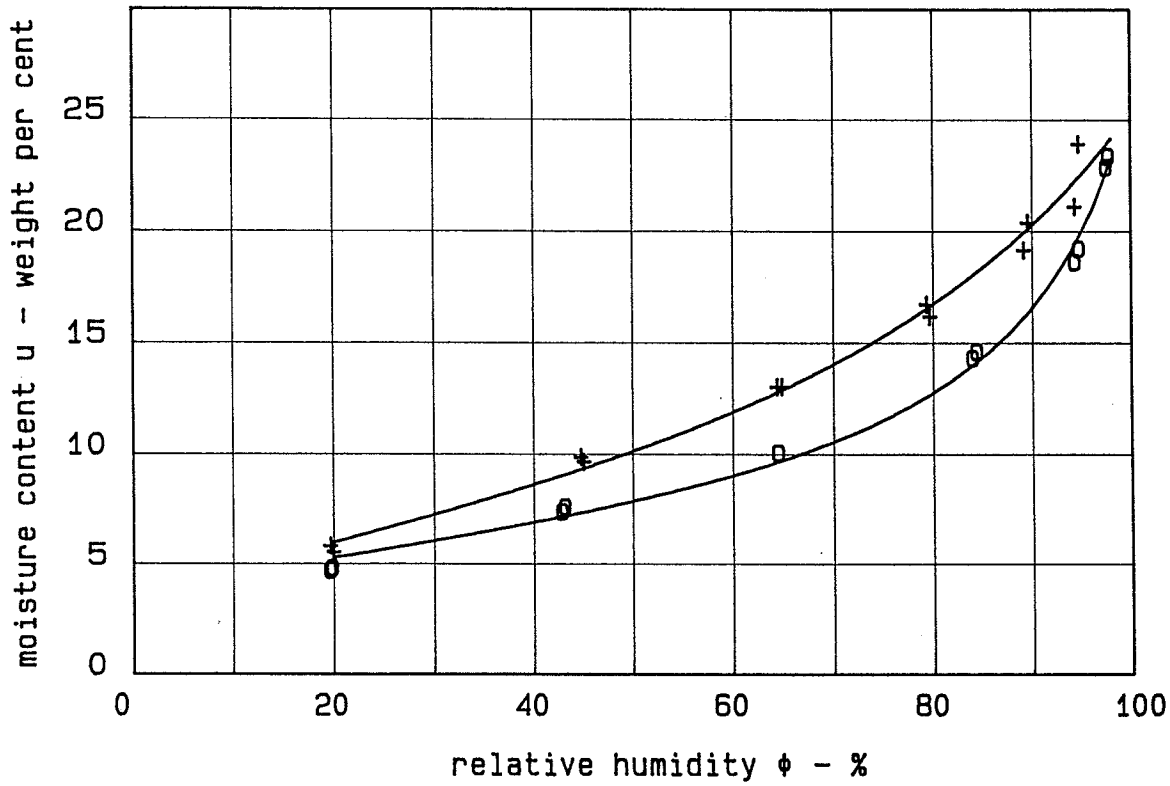
Notes: Density not indicated.

Litterature: Krischer, O.: Die wissenschaftlichen Grundlagen der Trocknungstechnik. Springer-Verlag. Berlin. Gottingen. Heidelberg. 1963.

Date: 16-10-85 Initials: KKH File: \v_z\woodme80

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

BOARD hard 1000 kg/m^3 20.0°C



\+ measured desorption values

ϕ	94.7	94.3	89.5	89.1	79.3	79.7	64.4	64.8	44.8	45.1	19.6	20.0
u	23.9	21.1	20.4	19.2	16.7	16.2	13.0	13.0	9.9	9.6	5.8	5.6

Approximation:
u= 2.53E+01*exp((-1/1.20)*ln(1-ln(ϕ)/ 3.48E-01))

o measured adsorption values

ϕ	19.6	19.8	42.8	43.1	64.5	84.0	84.4	94.3	94.7	97.5	97.7
u	4.7	4.8	7.4	7.6	10.1	14.3	14.6	18.6	19.2	22.9	23.4

Approximation:
u= 2.64E+01*exp((-1/1.98)*ln(1-ln(ϕ)/ 6.97E-02))

No scanning values

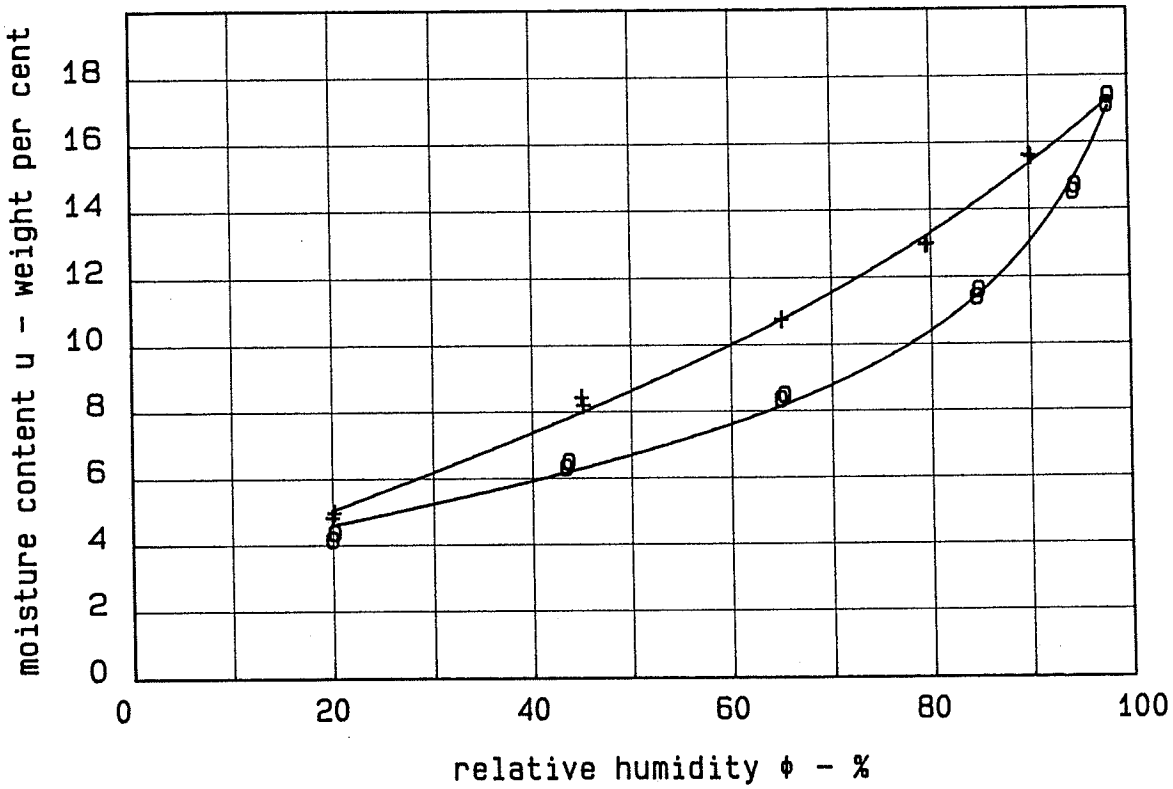
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: A_B\BOARDH20.100

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

BOARD oil-hardened 1050 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	90.0	90.2	79.6	79.4	65.0	45.0	45.2	20.1	19.9
u	15.6	15.6	13.0	13.0	10.8	8.4	8.2	5.0	4.8

Approximation:
u= 1.78E+01*exp((-1/0.93)*ln(1-ln(ϕ)/ 7.26E-01))

o measured adsorption values

ϕ	19.9	20.2	43.4	43.6	64.9	65.2	84.5	84.7	94.4	94.6	97.9	98.1
u	4.2	4.4	6.3	6.5	8.4	8.5	11.4	11.6	14.5	14.7	17.1	17.4

Approximation:
u= 1.87E+01*exp((-1/2.04)*ln(1-ln(ϕ)/ 9.73E-02))

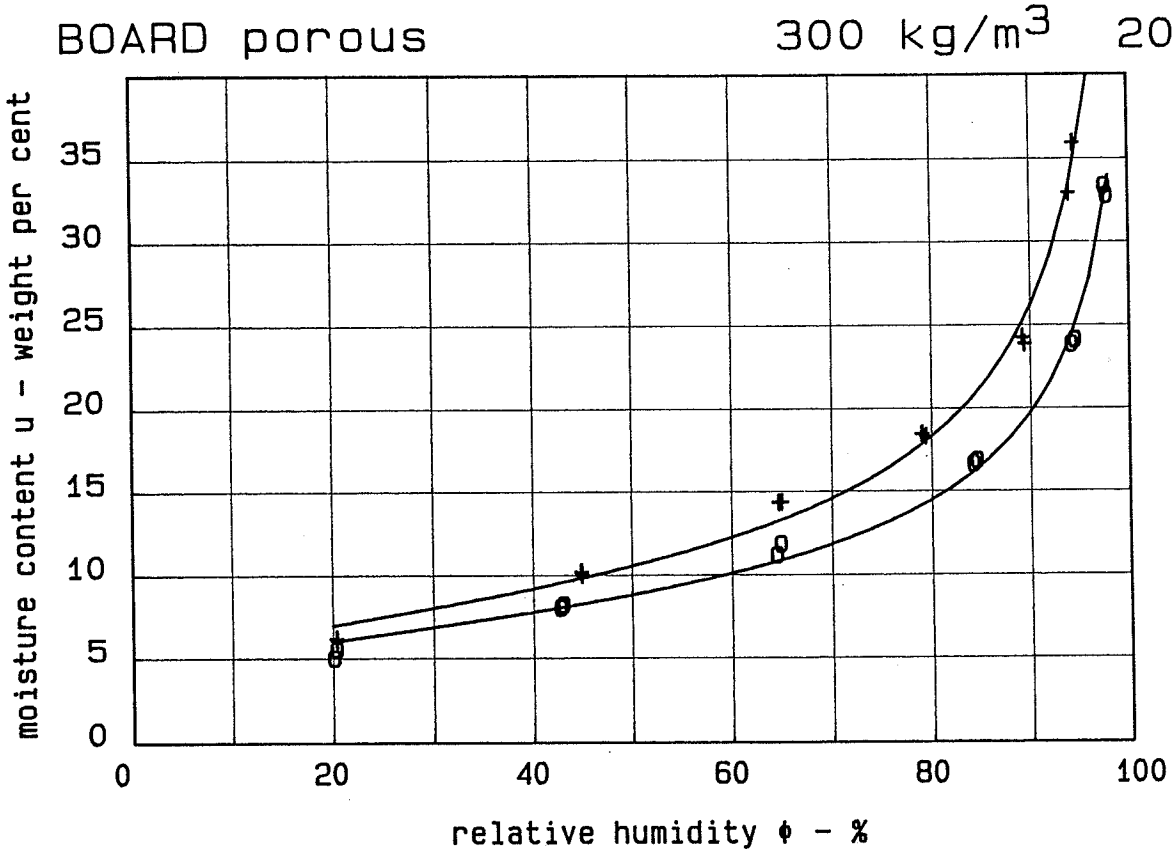
No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: A_B\BOARD020.105

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



\+ measured desorption values

ϕ 94.4 94.0 89.2 89.4 79.0 79.4 64.6 65.0 44.9 44.9 20.3 20.4
u 36.0 33.0 24.3 23.9 18.5 18.3 14.3 14.4 10.2 10.0 6.2 6.1
Approximation:
u= 1.12E+02*exp((-1/2.03)*ln(1-ln(ϕ)/ 5.80E-03))

o measured adsorption values

ϕ 20.1 20.4 42.8 43.0 64.5 64.9 84.2 84.6 94.2 94.5 97.8 97.6
u 5.0 5.6 8.0 8.2 11.2 11.8 16.6 16.8 23.9 24.1 32.8 33.4
Approximation:
u= 4.85E+01*exp((-1/2.19)*ln(1-ln(ϕ)/ 1.71E-02))

No scanning values

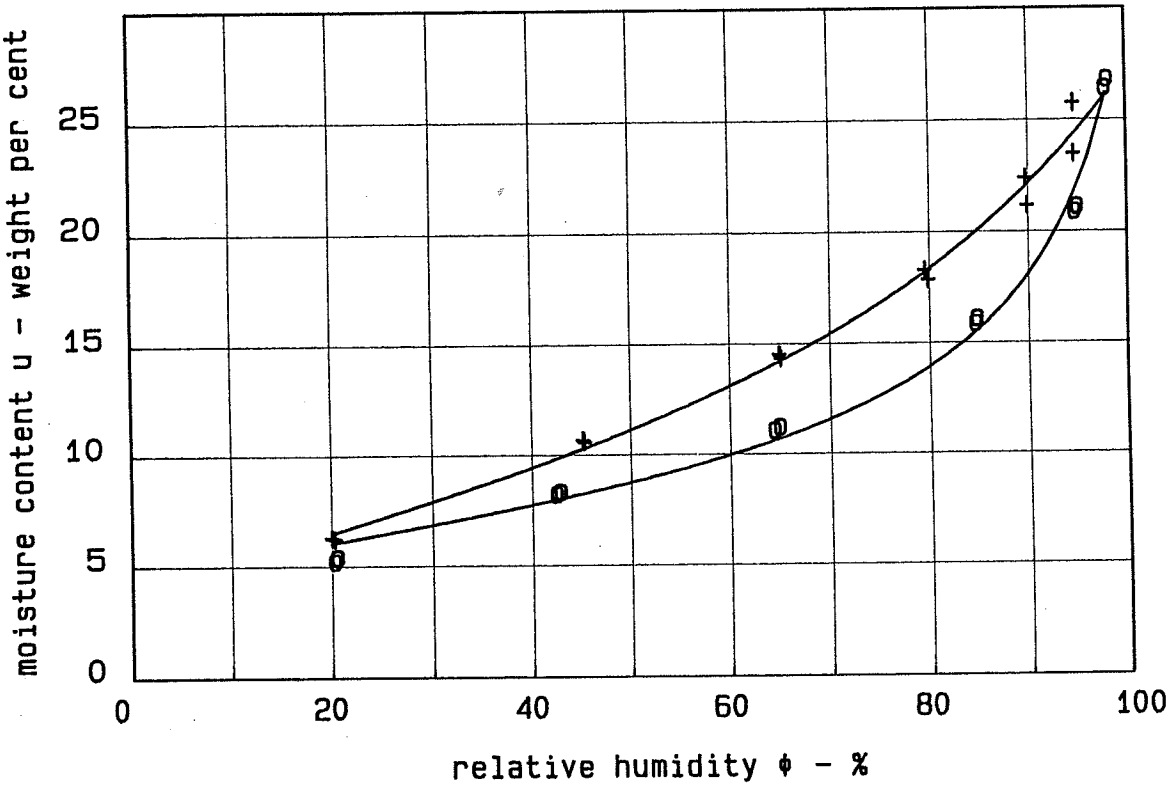
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: A_B\BOARDP20.300

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

BOARD semi-hard 780 kg/m^3 20.0 °C



\+ measured desorption values

ϕ	94.6	94.6	89.7	89.9	79.5	79.9	65.0	65.1	45.2	45.3	20.0	20.3
u	25.8	23.5	22.4	21.2	18.3	17.9	14.5	14.3	10.7	10.6	6.3	6.2

Approximation:
u= 2.73E+01*exp((-1/1.13)*ln(1-ln(ϕ)/ 3.94E-01))

o measured adsorption values

ϕ	20.3	20.6	42.5	42.9	64.5	65.0	84.6	84.8	94.7	95.0	97.9	98.1
u	5.2	5.4	8.2	8.3	11.1	11.2	15.9	16.1	20.9	21.1	26.4	26.8

Approximation:
u= 3.07E+01*exp((-1/2.16)*ln(1-ln(ϕ)/ 4.93E-02))

No scanning values

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: A_B\BOARDS20.780

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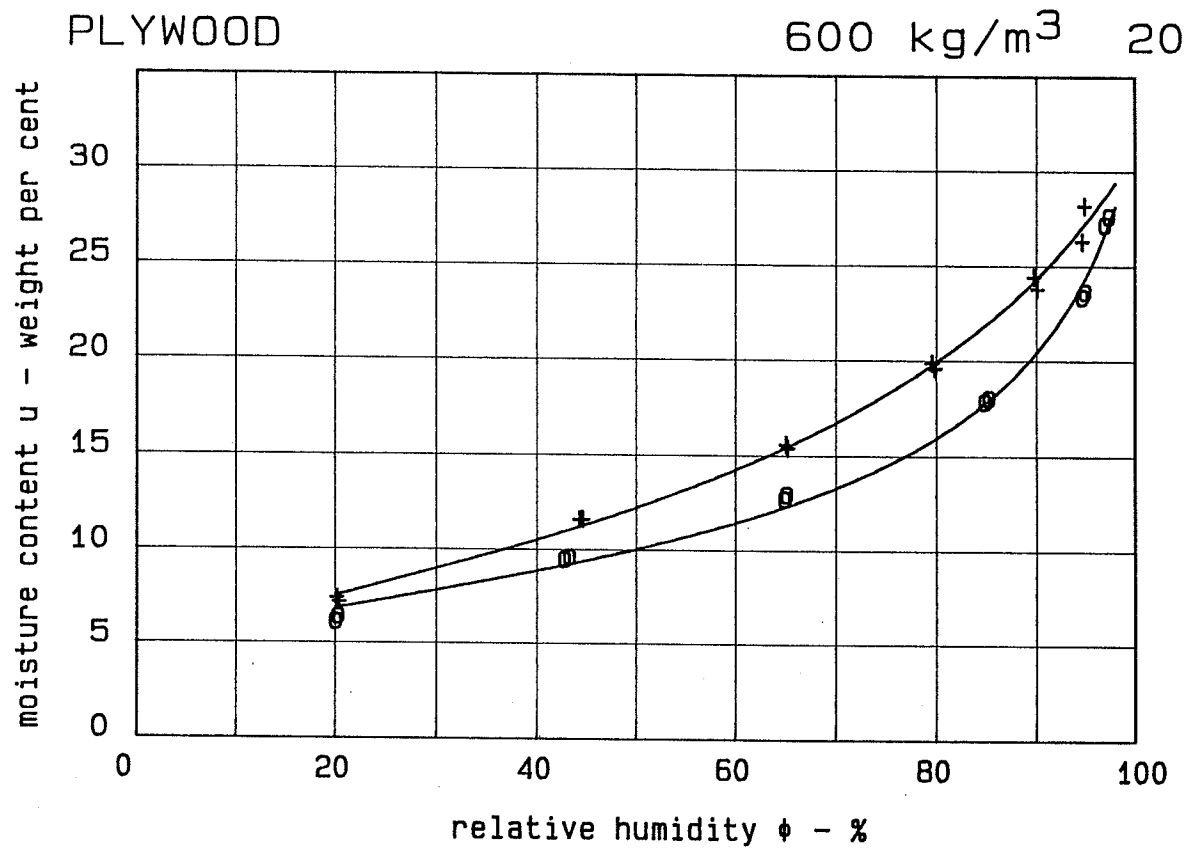
Sorption of water in building materials



\+ measured desorption values

ϕ	94.8	94.6	89.7	90.1	79.5	79.8	65.0	65.2	44.3	44.6	20.1	20.4
u	28.2	26.3	24.5	23.8	19.9	19.6	15.6	15.4	11.6	11.6	7.4	7.2

Approximation:
u= 3.10E+01*exp((-1/1.38)*ln(1-ln(ϕ)/ 2.67E-01))

o measured adsorption values

ϕ	20.0	20.2	42.7	43.2	64.9	65.1	84.8	85.2	94.6	94.9	96.9	97.3
u	6.1	6.4	9.5	9.6	12.7	13.0	17.9	18.0	23.4	23.7	27.2	27.6

Approximation:
ū= 3.17E+01*exp((-1/2.06)*ln(1-ln(ϕ)/ 7.20E-02))

No scanning values

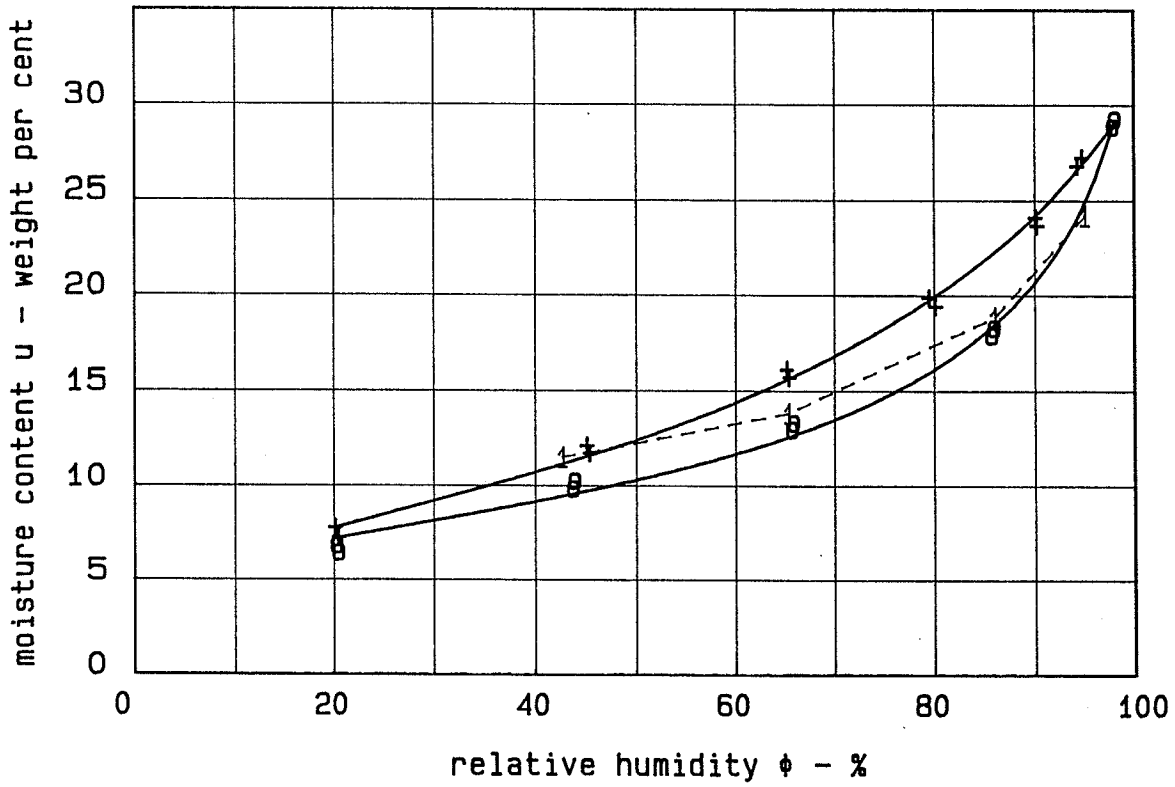
Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \M_U\PLYW0020.600

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials

WOOD-PARTICLE BOARD 610 kg/m^3 20.0°C



\+ measured desorption values

ϕ	94.7	94.2	90.0	90.2	79.5	80.2	65.1	65.4	45.1	45.4	20.1	20.5
u	27.2	26.8	24.1	23.7	19.9	19.4	16.1	15.7	12.1	11.7	7.8	7.2

Approximation:
u= 3.06E+01*exp((-1/1.42)*ln(1-ln(ϕ)/ 2.67E-01))

o measured adsorption values

ϕ	20.5	20.3	43.8	43.9	65.7	65.9	85.7	86.0	97.9	98.1
u	6.4	6.8	9.8	10.2	13.0	13.3	17.9	18.3	28.8	29.2

Approximation:
u= 3.34E+01*exp((-1/2.20)*ln(1-ln(ϕ)/ 5.65E-02))

1 measured scanning values

ϕ	42.6	65.3	86.0	95.0
u	11.5	13.8	18.9	24.2

Notes:

Litterature: Ahlgren, Lennart: Moisture fixation in porous building materials. Div. of Build. Techn., Lund Inst. of Techn. Report 36, Lund, Sweden, 1972.

Date: 9-10-85 Initials: KKH File: \V_Z\WOODPB20.610

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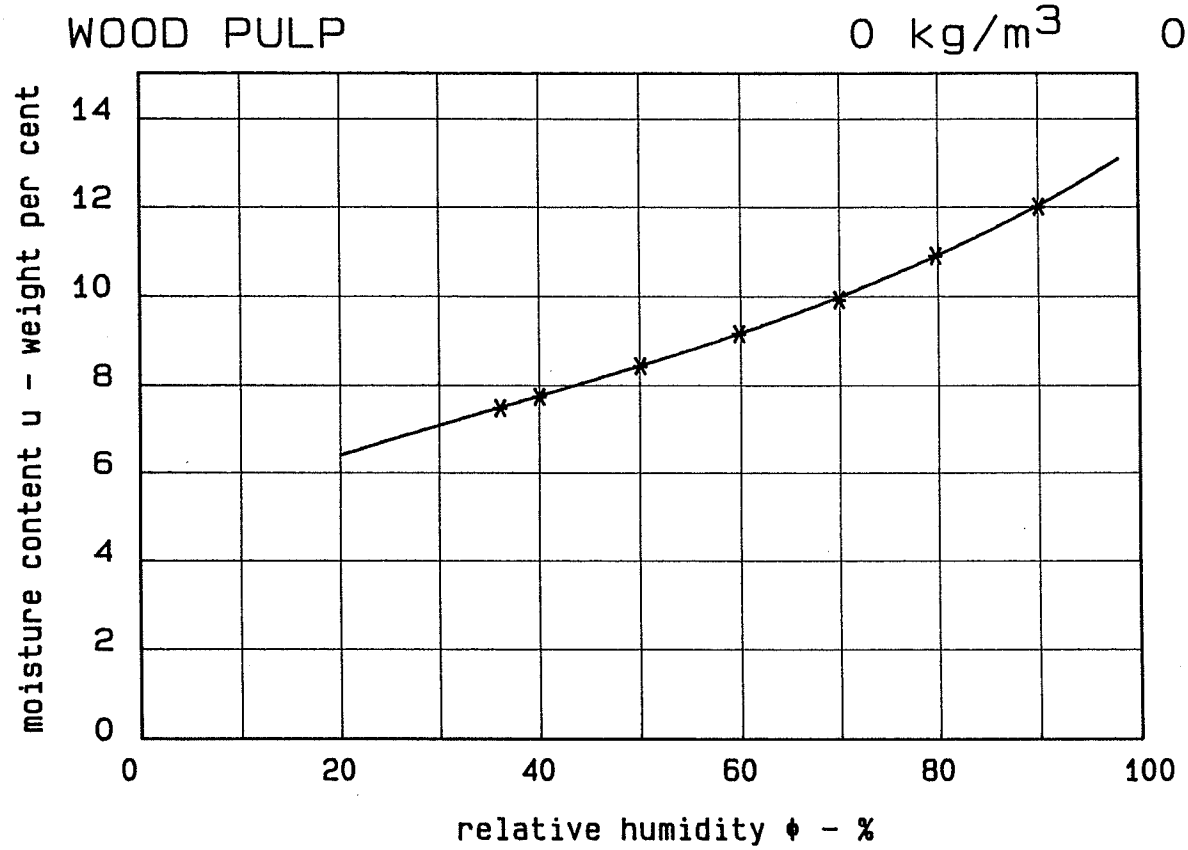
Sorption of water in building materials



* measured sorption values

ϕ	36.1	40.0	50.1	59.9	70.0	79.8	90.1
u	7.5	7.7	8.4	9.2	9.9	10.9	12.0

Approximation:

u= 1.34E+01*exp((-1/2.19)*ln(1-ln(ϕ)/ 3.97E-01))

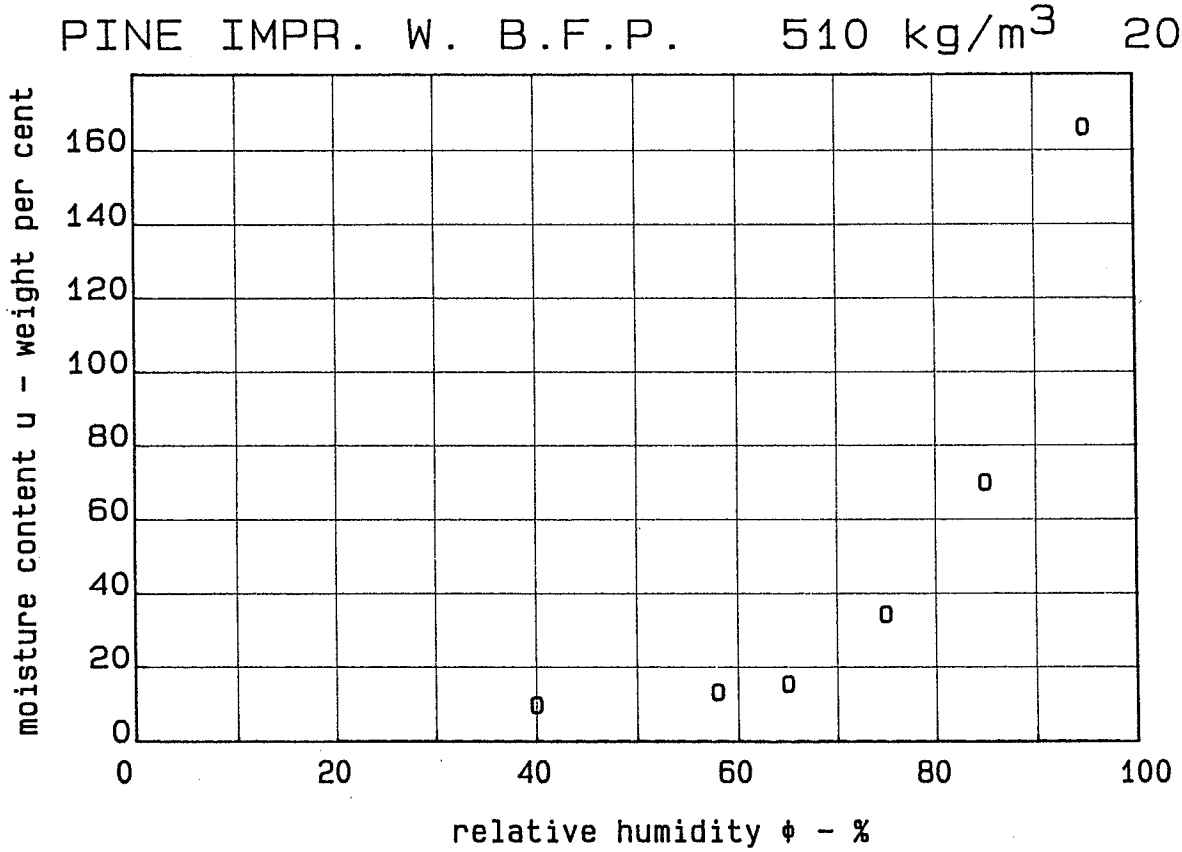
No scanning values

Notes: Density and temperature not indicated.

Litterature: Luck, Winfried: Feuchtigkeit. Grundlagen, messen, regeln. R. Oldenbourg. Munchen. Wien. 1964.

Date: 15-10-85 Initials: KKH File: woodpulp

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	40.0	58.0	65.0	75.0	85.0	95.0
u	9.6	13.1	15.3	34.1	69.8	165.9

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

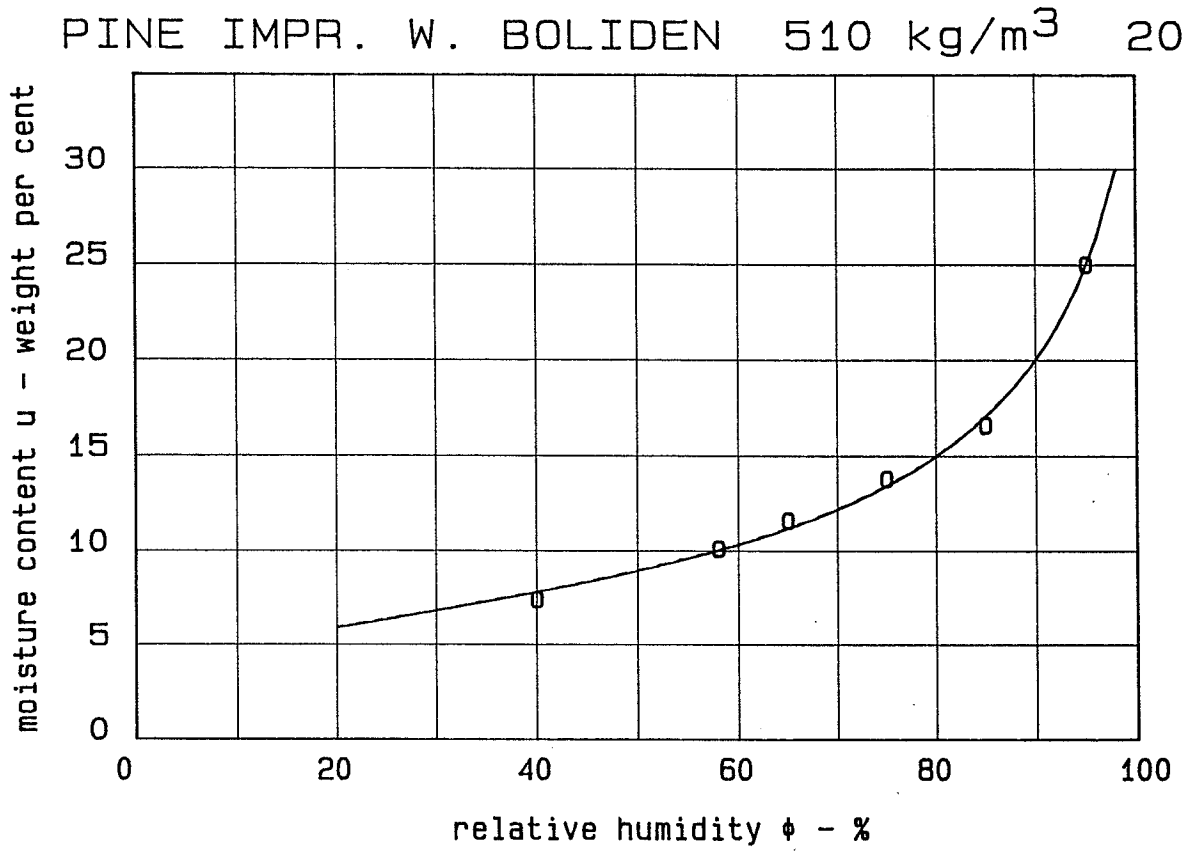
No scanning values

Notes: Pinesapwood (Pinus Sylvestris). Impr. w. Boliden Flame Proof. Moisture content u in % is related to dry dens. of unimpr. wood. Salt retent. 38.1%.

Litterature: Hoffmeyer, Preben: Undersoegelse af ligevaegts-vandindhold, svelning og udvaskelighed for tryk-brandimpraegneret fyrretrae. Build. Mat. Lab. 1980.

Date: 24- 3-86 Initials: KKH File: \A_B\BOLFPROF

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	40.0	58.0	65.0	75.0	85.0	95.0
u	7.4	10.1	11.6	13.8	16.6	25.0

Approximation:

u= 3.55E+01*exp((-1/1.93)*ln(1-ln(ϕ)/ 5.23E-02))

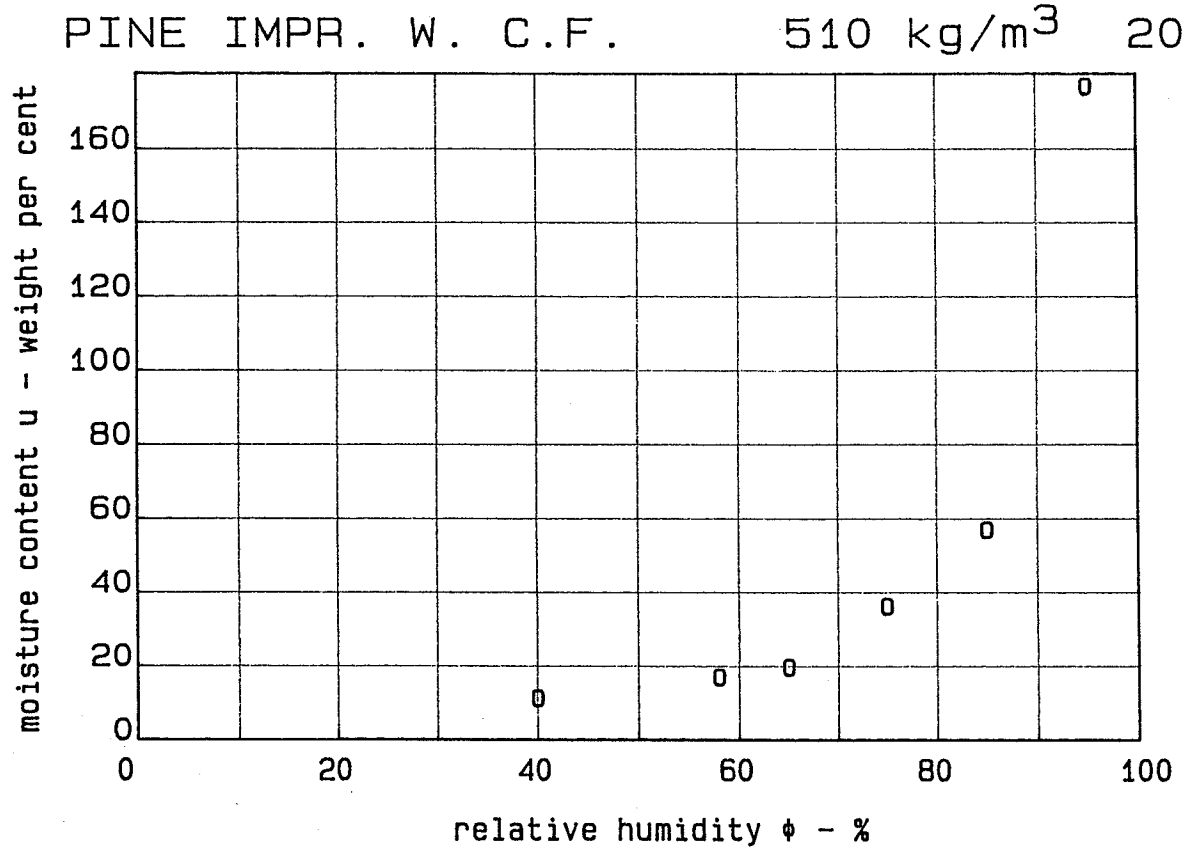
No scanning values

Notes: Pinesapwood (Pinus Sylvestris). Impr. w. Boliden K33. Moisture content u in % is related to dry density of unimpr. wood. Salt retention 1.9%.

Litterature: Hoffmeyer, Preben: Undersoegelse af ligevaegts-vandindhold, svelning og udvaskelighed for tryk-brandimpraegneret fyrretrae. Build. Mat. Lab 1980

Date: 24- 3-86 Initials: KKH File: \a_b\bolidk33

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	40.0	58.0	65.0	75.0	85.0	95.0
u	11.1	16.8	19.5	36.0	56.7	176.6

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

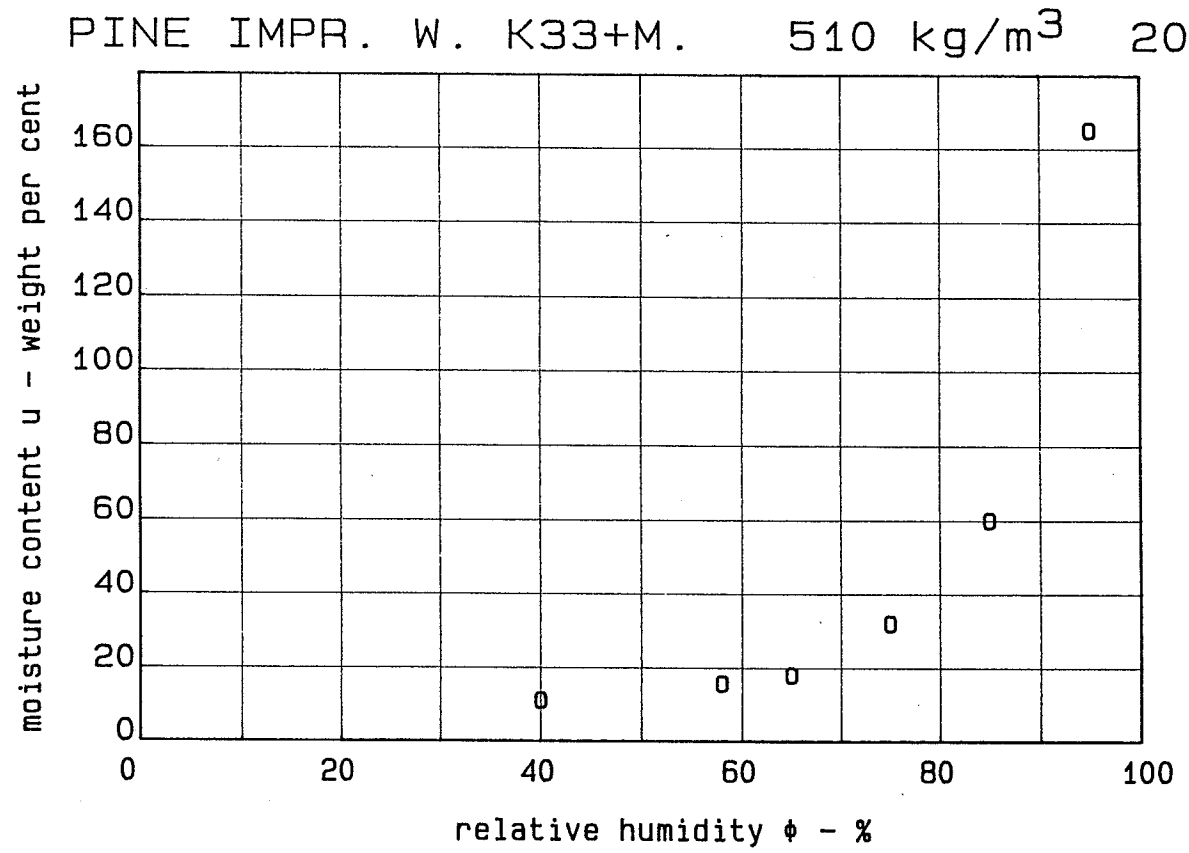
No scanning values

Notes: Pinesapwood (Pinus Sylvestris). Impr. w. Celcure F. Moisture content u in % is related to dry dens. of unimpr. wood. Salt retention 43.7%.

Litterature: Hoffmeyer, Preben: Undersoegelse af ligevaegts-vandindhold, svelning og udvaskelighed for tryk-brandimpraegneret fyrretrae. Build. Mat. Lab. 1980.

Date: 24- 3-86 Initials: KKH File: \C\CELCUREF

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	40.0	58.0	65.0	75.0	85.0	95.0
u	11.0	15.6	17.9	32.0	60.0	165.0

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

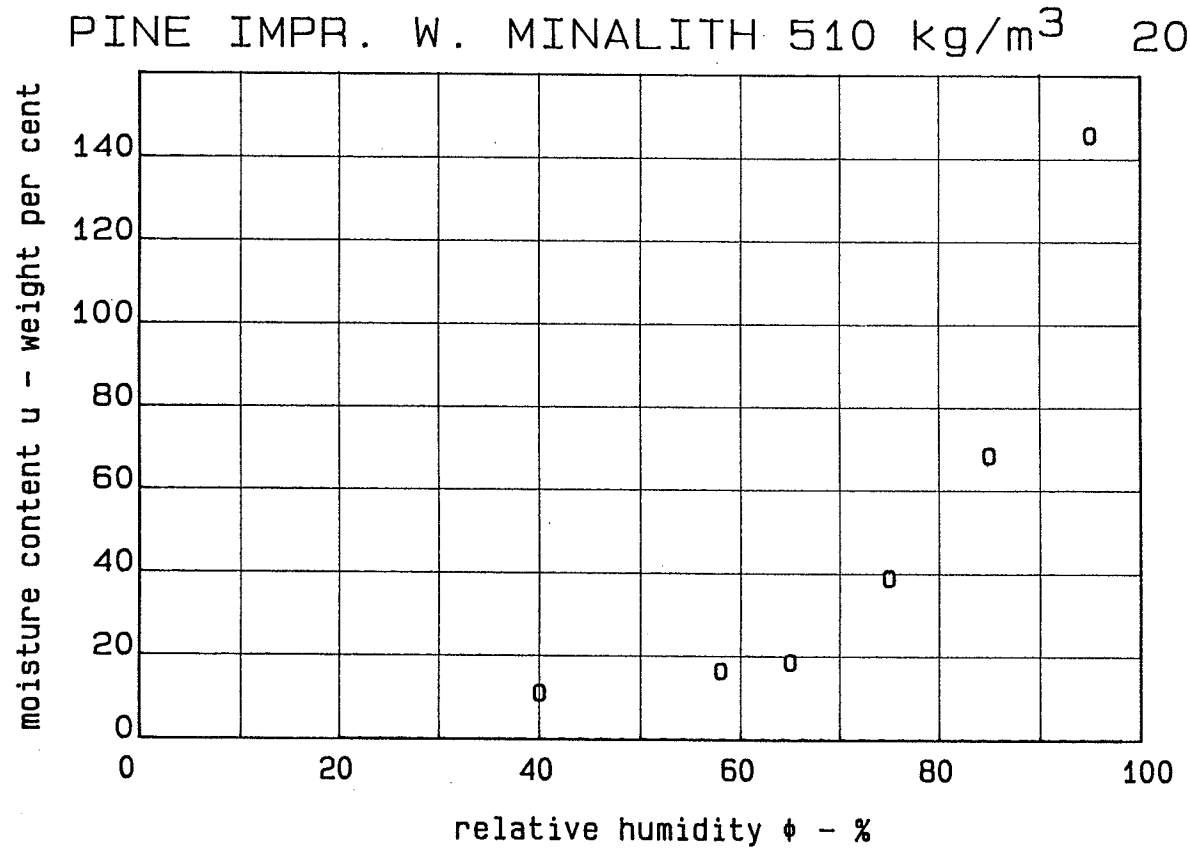
No scanning values

Notes: Pinesapwood (Pinus Sylvestris). Impr. w. K33+Minalith. Moisture content u in % is related to dry density of unimpregnated wood. Salt retention 36.8%.

Litterature: Hoffmeyer, Preben: Undersoegelse af ligevaegtsvandindhold, svelning og udvaskelighed for trykbrandimpraegneret fyrretrae. Build. Mat. Lab. 1980.

Date: 24- 3-86 Initials: KKH File: \D_K\K33MINAL

TECHNICAL UNIVERSITY OF DENMARK, Building Materials Laboratory
Sorption of water in building materials



o measured adsorption values

ϕ	40.0	58.0	65.0	75.0	85.0	95.0
u	11.0	16.4	18.5	38.9	68.3	145.7

Approximation:
u= 0.00E+00*exp((-1/1.00)*ln(1-ln(ϕ)/ 1.00E+00))

No scanning values

Notes: Pinesapwood (Pinus Sylvestris). Number of samples: 18. Moisture content u in % is related to dry density of unimp. wood. Salt retention 35.7%.

Litterature: Hoffmeyer, Preben: Undersoegelse af ligevaegts-vandindhold, svelning og udvaskelighed for tryk-brandimpraegneret fyrretrae. Build. Mat. Lab. 1980

Date: 9-10-85 Initials: KKH File: \M_U\MINALITH.510